THE SOCIALIZATION OF ADOLESCENT RISK BEHAVIOR: PARENT AND PEER INFLUENCES IN A LARGE, LONGITUDINAL SAMPLE

by

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Submitted to the graduate degree program in The Department of Educational Psychology and the Faculty of the Graduate Faculty of the University of Kansas in partial fulfillment of the requirements for the degree of Doctor of Philosophy.

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Dissertation defended: July 20, 2015

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ABSTRACT

Previous research has not been explicitly clear about which relational influences, parents or peers, affect individual risk behavior, and vice versa. This may be attributed to the use of various methodological designs. This study examined the reciprocal influences of parents and peers on individual risk behavior by explicitly testing two different sociological theories: the group socialization theory (Harris, 1995) and the stage-environment fit theory (Eccles et al., 1993). Longitudinal data were used from the National Institute of Child Health and Human Development (NICHD) to investigate peer risk behavior, individual risk behavior, and child-parent relationship quality influences in the early to middle adolescent stages of development. Longitudinal cross-lagged latent variable panel models were used to investigate the interrelatedness of these relationships using a general construct of risk behavior. Results supported full strong longitudinal measurement invariance for individual risk behavior and child-parent relationship quality, but only weak invariance for peer risk behavior. The latent parameters (factor variances, latent means) were mostly non-invariant across the stages of development, with increases in individual risk behavior with concomitant decreases in child-parent relationship quality over time. After controlling for previous levels of peer risk behavior, individual risk behavior explained changes in subsequent peer risk behavior and in the same magnitude (β = .33 to .61) across the stages of development. Peer risk behavior did not explain changes in subsequent individual risk behavior. Child-parent relationship quality did not explain changes beyond itself. Individual risk behavior and child-parent relationship quality were stable across the stages of development, whereas peer risk behavior was less stable. Those structural relations that were tested in multi-group longitudinal panel

models showed that the latent regression pathways were invariant across gender groups. These findings provide limited support for the stage-environment fit theory (Eccles et al., 1993) and the group socialization theory (Harris, 1995).

ACKNOWLEDGEMENTS

My experience in graduate school at the University of Kansas has been one characterized by hard work and gratitude. My natural curiosity, dedication, and most importantly, the individuals in my life, have played an essential role. I wish to thank Patricia Lowe for her guidance, mentorship, and encouragement throughout graduate school; Christopher Niileksela, for his advice and assistance throughout my training; and David Hansen and Amy Mendenhall for kindly serving on my dissertation committee. Most importantly, I wish to express sincere gratitude to my advisor and chairperson, Matthew Reynolds. Matt has provided me with opportunities for research and collaboration throughout graduate school. He has helped me to be a critical consumer and producer of high-quality research, as Matt naturally makes those around him smarter. I feel privileged and honored to have had him as a mentor. I only hope to exemplify the same rigorous standards Matt has shown me.

I also wish to express gratitude to my friend, Benjamin Mason, who has played a vital role in my trajectory. Benjamin's natural creativity and strong curiosity is contagious and I look forward to many years of collaboration. I would be remiss not to mention Luke McCune, who has provided me with invaluable advice and support about many different quantitative methods issues.

I also wish to thank my parents and brother for their support throughout my life. They have played a vital role in getting me here today. Finally, I wish to thank my wife, Liz, for her unwavering support and dedication despite all the demands of graduate school. She has been central to everything important I have accomplished. Without her I would not be where I am today. I am forever indebted to her.

TABLE OF CONTENTS

CHAPTER I: INTRODUCTION **1**

Risk Behavior....2

Adolescence and Risk Behavior....2

Social Learning Theory and Risk Behavior....3

Sociological Theories of Risk Behavior....4

Group socialization theory....5

Stage-environment fit theory....5

Previous Risk Research with Child-Parent Relationships and Peer Groups....6

Child-parent relationship....9

Peer groups....10

Summary....11

Individual and Peer Risk Behavior and Child-Parent Relationship Constructs....13

Research Questions for Current Study....14

Rationale for Current Study....17

Limitations....18

CHAPTER II: REVIEW OF THE LITERATURE **20**

What is Risk Behavior?....20

Adolescence and Risk Behavior....21

Prevalence of Individual Risk Behavior from Middle School through High School....22

Middle school....22

High school....24

Risk behavior summary....27

Individual Risk Behavior Outcomes 27

Theoretical Overview 28

Theoretical Perspective on the Development of Risk Behavior 29

Cognitive perspective 29

Emotional perspective 31

Biological perspective 32

Social perspective 34

Group socialization theory 34

Stage-environment fit theory 35

Child-Parent Relationship and Peer Groups in Risk Behavior 36

Child-parent relationship in risk behavior 36

Attachment 36

Parental warmth 38

Parental conflict 38

Summary 39

Peer groups in risk behavior 39

Summary 42

Child-parent relationship and peer groups in risk behavior 42

Summary 52

Needed Research 52

Methodological Considerations 53

Longitudinal Structural Equation Modeling 53

Longitudinal factorial invariance 54

Mediation and cross-lagged 55

Demographic influences.. 56

Previous Research 57

Conceptualization of risk behavior 57

Factorial invariance 59

Longitudinal mediation 59

Causal system 60

Purpose of the Study 60

CHAPTER III: METHOD **62**

Longitudinal Sample 62

Participants 62

Measures 64

Risk behavior 64

Individual risk behavior 64

Peer risk behavior 66

Risk behavior validity 67

Child-parent relationship quality 69

Child-parent relationship quality validity 70

Missing Data 71

Analytic Plan 75

Measurement models 75

Longitudinal factorial invariance 77

Cross-lagged panel model 80

Mediation model 81

Demographic influences 83

Model Evaluation 83

CHAPTER IV: RESULTS **86**

Missing Data 86

Item Level Descriptive Statistics 87

Measurement Models 88

Unidimensionality testing 88

Individual risk behavior 89

Reckless behavior 89

Rebellious behavior 90

Antisocial behavior 91

Peer risk behavior 93

Reckless behavior 93

Rebellious behavior 94

Antisocial behavior 95

Child-parent relationship quality 96

Closeness 96

Conflict 97

Parcel Level Descriptive Statistics 98

Longitudinal CFA model 99

Research Question 1 100

Summary 102

Research Question 2 103

Summary 106

Research Question 3 107

Unconditional model 107

Summary 110

Conditional model 111

Summary 115

Multi-group longitudinal CFA model 116

Research Question 4 117

Summary 118

CHAPTER V: DISCUSSION **119**

Group socialization theory 120

Stage-environment fit theory 123

Implications for theory and practice 124

Limitations of the current study 127

Conclusions and future directions 129

REFERENCES **131**

APPENDIX **178**

LIST OF TABLES

Table 1. Prevalence rates of youth that engage in risk behaviors 151

Table 2. Item and parcel descriptives for individual risk behavior.....152

Table 3. Item and parcel descriptives for peer risk behavior 154

Table 4. Item and parcel descriptives for child-parent relationship quality 156

Table 5. Standardized factor loadings from unidimensionality tests of reckless, rebellious, and antisocial behavior in individual risk behavior 158

Table 6. Standardized factor loadings from unidimensionality tests of reckless, rebellious, and antisocial behavior in peer risk behavior 159

Table 7. Standardized factor loadings from unidimensionality tests for closeness and conflict in child-parent relationship quality.....160

Table 8. Coefficient alphas for individual risk behavior, peer risk behavior, and child-parent relationship quality scales and parcels.....161

Table 9. Factor intercorrelations of peer risk behavior, individual risk behavior, and child-parent relationship quality for fifth, sixth, and ninth grades 162

Table 10. Standardized factor loadings for peer risk behavior, individual risk behavior, and child-parent relationship quality in fifth, sixth, and ninth grades 163

Table 11. Longitudinal invariance of measurement and structural parameters across fifth, sixth, and ninth grades 164

Table 12. Latent means and standardized effect sizes for the latent mean differences for individual risk behavior and child-parent relationship quality in fifth, sixth, and ninth grades.....165

Table 13. Fit statistics for structural model evaluation of the unconditional and conditional longitudinal cross-lagged panel models.....166

Table 14. Unstandardized and standardized regression coefficients and proportion of variance explained for the final conditional cross-lagged panel model.....167

Table 15. Within-time correlations/residual correlations in the final conditional cross-lagged panel model 168

Table 16. Unstandardized coefficients for gender, SES, and race/ethnicity covariates at 5th grade in the final conditional cross-lagged panel model 169

Table 17. Multiple-group longitudinal invariance of latent regressions.....170

LIST OF FIGURES

Figure 1. Initial model estimated 171

Figure 2. Hypothesized model for the group socialization theory.....172

Figure 3. Hypothesized model for the stage-environment fit theory 173

Figure 4. Configural (unconstrained) longitudinal CFA model for peer risk behavior, individual risk behavior, and child-parent relationship quality across grade 5, grade 6, and grade 9 174

Figure 5. Cross-lagged panel model with phantom variables.....175

Figure 6. Final unconditional cross-lagged panel model with phantom variables 176

Figure 7. Final conditional cross-lagged panel model with phantom variables 177

Chapter I: Introduction

Why do some people engage in delinquent behavior? Why do some people engage in reckless driving decisions that lead to fatal vehicular accidents? Or, why do some people intentionally engage in unhealthy substance use behaviors that can potentially lead to life-changing circumstances? Are these behavioral tendencies related? Further, are they avoidable or amenable to change? Are there indicators of these tendencies early on in life, and, if so, what or who are the influences? The focus of this study was on the influences of these tendencies, or risk behavior, through early to middle adolescence. Specifically, the purpose was to clarify how a parent's perception of the quality of the relationship with their child and how the frequency of risk behavior the child's peers demonstrate influence the child's own risk behavior. For example, with regard to the development of risk behavior in an individual, does the quality of the child-parent relationship matter? Do peer groups matter? If they both matter, does one matter more? Furthermore, does the strength of these relational influences change within early to middle adolescence? Last, does the amount of risk behavior demonstrated by an individual influence these relationships from early to middle adolescence?

Relationships are important and help shape who we are and who we become. Relationships can serve as catalysts to academic and social success or they can serve as roadblocks to an otherwise healthy development. Because adolescence is a vulnerable transition period associated with substantial increases in risk behaviors, relationships are all the more important during this period of development (Eccles et al., 1993; Gutman & Eccles, 2007). A better understanding of how relationships with peers and parents affect adolescent risk behaviors is important so that these relationships may be targeted to alter

risk behaviors. Risk behaviors during adolescence may result in unintentional and irreversible consequences (e.g., prison, death) or consequences that complicate one's future (e.g., school dropout, unintended pregnancy; Arnett, 1992; Freudenberg & Ruglis, 2007; Lessard et al., 2008; Mulye et al., 2009; Reyna & Farley, 2006).

Risk Behavior

Risk behavior has been referred to in a variety of terms including externalizing behaviors, antisocial behaviors, problem behaviors, delinquency, and normbreaking behaviors (Boyer, 2006). These behaviors can cause undue harm to property, oneself, or others. Although these behaviors are classified broadly as risk behavior, sometimes they are described more specifically as thrill-seeking (e.g., skipping school, sky diving), rebellious (e.g., underage drinking, staying out late), reckless (e.g., reckless driving, unprotected sex), and antisocial (e.g., cheating, aggression) behaviors (Gullone, Moore, Moss, & Boyd, 2000). These more specific behaviors, however, are all interrelated suggesting a general risk behavior construct underlies them (Ary, Duncan, Duncan, & Hops, 1999; Caspi et al., 1997; Goldstein, Davis-Kean, & Eccles, 2005; Zuckerman & Kuhlman, 2000). Capturing these interrelated behaviors is important when investigating risk from a developmental perspective.

Adolescence and Risk Behavior

According to the American Psychological Association (Gentry & Campbell, 2002), adolescence consists of three critical transition periods from childhood to adulthood. Specifically, these developmental stages of adolescence are early adolescence (approximately 10–13 years of age), middle adolescence (approximately 14–16 years of age), and late adolescence (approximately 17–19 years of age). Adolescence is an

important time for development because adolescents are in a constant state of change. During this transition period, adolescents experiment with new roles, identities, and responsibilities, and seek a greater degree of independence (Lightfoot, 1997). Adolescence is also a time when individuals are especially vulnerable to the influence of others just as key changes in social relationships are occurring (Eccles et al., 1993; Gutman & Eccles, 2007; Gutman, Eccles, Peck, & Malanchuk, 2011).

Adolescence is associated with a substantial increase, and often times a peak, in risk behavior. There is an increase in substance use, risky sexual behaviors, reckless and unsafe driving, and violent and criminal behaviors (Arnett, 1992; Reyna & Farley, 2006; Steinberg, 2008). The serious nature and heightened frequency of these behaviors during adolescence, along with changes in key social relationships (Gutman & Eccles, 2007; Gutman et al., 2011) and increased influence of others outside the home that occur during adolescence (Collins & Laursen, 2004), suggest a possible relation between risk behavior and social relationships.

Social Learning Theory and Risk Behavior

Why is it that risk behavior increases in intensity during adolescence? Social learning theory may provide some answers. The theory is premised on the idea that learning occurs within a social context so that individuals learn behavior through observation, imitation, and modeling. Learning within social contexts is thus the mechanism by which behaviors (risk and other) are transmitted from one person to another (Bandura, 1971; 1978).

One concept in social learning theory, reciprocal determinism, is particularly germane in explaining why adolescents engage in risk behavior. Reciprocal determinism

posits that the environment (e.g., people), individual, and individual characteristics such as cognition or personality (e.g., attention, retention, motivation), all mutually influence one another in affecting learning and behavior change. Thus, within social contexts, changes in learning and behavior are dependent on the observation of other individuals and their communications (Forman et al., 2013; Schneider, Cavell, & Hughes, 2003). For example, in a family relationship, an adolescent learns how to behave in society by observing and communicating with their parents, which, in turn, influences the interaction and relationship between the adolescent and their parent, and their environment (e.g., Bandura, 1978). Adolescents also learn how to behave via peers through a similar process, but in different social contexts. Different social contexts provide differential opportunities for learning for the adolescent while the adolescent also simultaneously influences the different environments (e.g., parents and peers).

Sociological researchers have investigated risk behavior as a function of relationships with parents and peer groups (Ary et al., 1999; Dekovic, Wissink, & Meijer, 2004; Dishion, Nelson, & Bullock, 2004; Goldstein et al., 2005; Nash, McQueen, & Bray, 2005; Van Ryzin, Fosco, & Dishion, 2012). Risk behavior is indeed associated with the quality of the child-parent relationship. A lower quality child-parent relationship has been associated with increases in risk behavior, whereas a higher quality child-parent relationship has been associated with decreases in risk behavior (Dekovic, 1999; Gutman & Eccles, 2007; Gutman et al., 2011; Nash et al., 2005). Further, risk behavior is indeed associated with relationships with peers. Relationships with deviant peers have been associated with increases in risk behavior (Clark & Loheac, 2007; Curran, Stice, & Chassin, 1997; Miller, Benson, & Galbraith, 2001; Sieving, Perry, & Williams, 2000).

Sociological Theories of Risk Behavior

Two sociological theories have been developed to explain how child-parent relationships and peer relationships influence adolescent risk behavior: (a) the group socialization theory (Harris, 1995; 2009) and, (b) the stage-environment fit theory (Eccles et al., 1993). The theories differ, however, in emphasizing the importance of each influence on individual behavior. The group socialization theory posits that only peer influence is important for determining adolescent behavior, whereas the stage-environment fit theory posits that both parents and peers are important, just at different developmental stages.

Group socialization theory. Group socialization theory posits that peer influences outside the home are not only relatively more important than parents', but are the only important relational influence on adolescent behavior that matter in the long term (Harris, 1995; 2009). According to Judith Rich Harris, the nurture assumption is "the notion that parents are the most important part of the child's environment and can determine to a large extent, how the child turns out" (pg. 14, 2009). Harris asserts this assumption is wrong. She argues that individuals are socialized, and their normative behaviors shaped, by the experiences they have outside the home (Harris, 2009). Furthermore, she argues that socialization by parents only affects how the individual behaves in the presence of their parents or in contexts associated with the parent (which is generally where questionnaires used for this type of research are completed).

Stage-environment fit theory. The stage-environment fit theory posits that both relational influences, parents and peers, are important in shaping adolescent behavior, but that the relative influences depend on the developmental stage (Eccles et al., 1993).

Specifically, both parent and peer influences shift in early adolescence with peer influences becoming increasingly more important than parent influences. Parent influences are largest during early adolescence, but decrease and subsequently remain stable throughout mid-to-late adolescence.

The relatively stronger influence of peers is due to a mismatch in the needs of the adolescent and the provision of those needs by the parent. Adolescents seek greater autonomy and more control during adolescence. Parents tend to have difficulty granting autonomy. Conflict arises. Conflict reduces open communication between the parents and the adolescent. Parents are viewed as less supportive. Conflict ultimately reduces closeness between the parents and the adolescent, and subsequently drives the adolescent to seek out closer relationships with peers. Peers' influence increases.

Furthermore, according to findings in support of the stage-environment fit theory (e.g., Gutman & Eccles, 2007) increased child-parent conflict, separate from peer influence, may increase risk behavior, which, in turn, may drive further conflict between the child and parent. Clearly, relationships with parents are important in stage-environment fit theory.

Previous Risk Research with Child-Parent Relationships and Peer Groups

Despite some of the prominent theories linking both parent and peer influences on risk behavior, studies often include only one of the two variables. Ideally, both parents and peer relationship information would be included in a study so that group socialization and stage-environment fit theories can be tested more explicitly. Further, because the group socialization and stage-environment fit theories are developmental theories regarding adolescent behavior, it follows that longitudinal research is ideal for capturing

these dynamic relational processes over time. Therefore, to best test these sociological theories related to risk behavior, risk behavior and parent and peer influences would be measured at multiple times during adolescence. These studies are rare. But, findings from various other studies suggest that both child-parent relationships and peer relationships are associated with adolescent risk behavior.

There have been a number of studies that have included either a child-parent relationship or peer relationship variable associated with a measure of risk behavior. For example, research has been conducted with only child-parent relationship quality and individual risk behavior (Gutman et al., 2011; Gutman & Eccles, 2007; Huebner & Howell, 2003; Miller et al., 2001). The link is well-established, suggesting an inverse association between the quality of the child-parent relationship and individual risk behavior. Similarly, other researches have investigated only peer influence and individual risk behavior (Clark & Loheac, 2007; Crosnoe & McNeely, 2008; Crosnoe, Muller, & Frank, 2004; Curran et al., 1997; Gardner & Steinberg, 2005; Sieving et al., 2000; Wallach, Kogan, & Bem, 1962), again, suggesting a link in which peer group influence and individual risk behavior are associated such that an increase in one (e.g., peer group influence) results in an increase in the other (e.g., individual risk behavior).

Studies of both child-parent relationship quality and peer influences on individual risk behavior have used a variety of analytic techniques to test their relative influences. For example, studies have used path analytic models (e.g., Bogenschneider, Wu, Raffaelli, & Tsay, 1998; Michael & Ben-Zur, 2007), multiple regression using cross-sectional data (e.g., Dekovic, 1999), and multiple regression using data collected longitudinally (e.g., Crosnoe, Erickson, & Dornbusch, 2002; Kim, Kwak, & Yun, 2010;

Wills, Resko, Ainette, & Mendoza, 2004). Findings from these studies generally support negative and positive associations with child-parent relationship quality and peer group influence, respectively. There has also been some inconsistencies in the findings, with parents relatively more important (Wills et al., 2004), peers relatively more important (Dekovic, 1999), and parents and peers roughly the same in influencing risk behavior (Kim et al., 2010; Michael & Ben-Zur, 2007). Last, one study found that peers directly influenced risk behavior while the child-parent relationship quality indirectly influenced risk behavior via its influence on peers (Bogenschneider et al., 1998). That is, the relationships with peers mediated the influence of the child-parent relationship on risk behavior.

A few studies have investigated child-parent relationship quality and peer influences within a longitudinal design. The findings from these studies suggest that child-parent relationship quality and peers are important influences of risk behavior (Ary et al., 1999; Goldstein et al., 2005; Nash et al., 2005). Furthermore, in general the findings have shown that peers are relatively more important (i.e., larger direct effects) in influencing risk behavior, though child-parent relationship quality may have an impact on risk behavior via its influence on peer groups. But, one limitation of these studies is that different variables at different developmental time points were used (Ary et al., 1999; Goldstein et al., 2005; Nash et al., 2005). The lack of consistent measurement using the same scales across time confounds the findings as they may be related to differences in the measurement (i.e., not controlling previous measurement, different measures at different times).

Last, other studies have included child-parent relationship quality and peer influence variables using a repeated measures longitudinal design (Pardini, Loeber, & Stouthamer-Loeber, 2005; Van Ryzin et al., 2012). Findings from these studies suggest that child-parent relationship quality and peer influence are differentially important at different times during adolescence. Van Ryzin and colleagues (2012) examined these relationships using manifest variables (composites), unable to control for measurement error, and only used a specific measure of risk (i.e., substance use). Pardini and colleagues (2005) examined these relationships using a restricted sample (only males), and risk behavior was measured as *beliefs* about risk behavior, not actual risk behavior. A unique contribution to the risk literature would be consistent measurement of these constructs across time using the same measures at each time, including a measure of general risk behavior, not specific risks or beliefs about risk behavior.

Child-parent relationship. In general, a positive child-parent relationship is associated with less risk behavior and a negative child-parent relationship is associated with more risk behavior (Ary et. al., 1999; Hops, Davis, & Lewin, 1999; Nash et al., 2005). A better understanding of that association is needed. For example, most of the research has studied unidirectional modes of influence, in which the quality of the child-parent relationship affects individual risk behavior (e.g., Bogenschneider et al., 1998; Coleman, 2003; Crosnoe et al., 2002; Dekovic, 1999; Gutman et al., 2011; Huebner & Howell, 2003; Michael & Ben-Zur, 2007; Miller et al., 2001; Wills et al., 2004). But risk behavior may also affect the quality of the child-parent relationship. Or the two may have reciprocal influences such that poor child-parent relationships results in more risk behavior, which in turn results in even poorer child-parent relationships (e.g., Gutman &

Eccles, 2007). Tests of a reciprocal influence between risk behavior and the quality of child-parent relationship are important because they may provide a more complete understanding within a system of influence that can be targets of intervention (e.g., instead of focusing solely on parenting practices it may be beneficial to consider altering individual behavior that can have positive recourse for child-parent relationships).

According to stage-environment fit theory, child-parent conflict is primarily a unidirectional process whereby child-parent conflict drives the adolescent to disassociate with them and increasingly associate with peers. The dissociation leads to increased risk behavior primarily through increased association with peers. However, increased risk behavior may further increase child-parent conflict, imitating a reciprocal relationship (Gutman & Eccles, 2007).

Peer groups. An adolescent's engagement in risk behavior can also be understood within the context of peer groups. There is an association between peer groups and risk behavior in which increased influence from peer groups is associated with an increase in risk behavior (Clark & Loheac, 2007; Crosnoe & McNeely, 2008; Michael & Ben-Zur, 2007; Sieving et al., 2000). But, how do peers influence risk behavior? A recurring theme within the risk literature is that adolescents need, and thus seek out, more autonomy and independence (Dekovic et al., 2004; Eccles et al., 1993; Gutman et al., 2011; Gutman & Eccles, 2007). According to the stage-environment fit theory, because adolescents want more independence, this causes conflict in the child-parent relationship (Eccles et al., 1993; Gutman & Eccles, 2007). So while increased conflict drives adolescents to seek out peers, peers help provide that need for independence. Thus peer groups take on an increasingly important role in having a direct

influence on risk behavior. However, according to group socialization theory, the roles of parents may be so relatively weak compared to peers that parents do not have direct influence on behavior (Harris, 2009). Rather it is solely in the context and interaction with peers that may explain differences in adolescent risk behavior.

Summary. In general, previous research indicates that child-parent relationship and peer influences are both important in the development of individual risk behavior but the developmental stage of influence and magnitude of influence are inconsistent (Dekovic, 1999; Kim et al., 2010; Michael & Ben-Zur, 2007; Nash et al., 2005; Pardini et al., 2005; Van Ryzin et al., 2012; Wills et al., 2004). The group socialization theory and the stage-environment fit theory can be used to explain these influences, however, given the complexity and developmental nature of these theories, few studies have been able to map the statistical models onto the theoretical models, leading to some inconsistencies in the literature with regard to the relative influences of parents and peers on risk behavior.

For example, in one of the seminal studies of parent and peer influences on risk behavior, Van Ryzin and colleagues (2012) showed that child-parent relationship quality and peer groups had different influences across development, with child-parent relationship influence at two stages (i.e., age 15 and 17) and peer group influence across all stages (i.e., ages 13, 15, 17, and 23). When both influences were statistically significant, the relative influence of child-parent relationships versus peer groups did not differ. Though they did not directly test the stage-environment fit or group socialization theories, there is some support for each theory. In support of the stage-environment fit theory, parents were important at ages 15 and 17 (same as peer group), and then peers became relatively more important at age 23. But it was inconsistent with stage-

environment fit theory because peers were more important than parents in early adolescence (i.e., age 13). Van Ryzin and colleagues findings supported the group socialization theory because peers were more important in early and late adolescence. The findings were inconsistent with group socialization theory, however, during mid-adolescence (i.e., ages 15 and 17) when parents and peers were equally important. It is important to note, however, that all of the findings were based on influences of adolescent substance use, not general risk behavior. Furthermore, according to Van Ryzin and colleagues (2012), "timeframes of measurement were not equal across all measures, which may have created an unknown degree of bias in the results" (p. 13). It is possible that these effects would differ had a general risk behavior construct been modeled and all timeframes of measurement been equal, which Van Ryzin and colleagues (2012) noted as a limitation of their study.

Perhaps the closest mapping of the statistical model onto the theoretical models that were tested in the current study involved a study by Pardini and colleagues (2005). This study included latent variables in a repeated measures longitudinal design. Their study showed that child-parent conflict directly related to increased association with deviant peers in early to middle adolescence (i.e., from 6th grade to 9th grade) with small and stable influences (β = .10–.12). Increased child-parent conflict increased beliefs about risk behavior only in 7th grade. Yet, across all grades (i.e., 6th grade to 11th grade) deviant peers influenced beliefs about risk behavior. Thus, peers were relatively more influential on beliefs about risk behavior than child-parent conflict (e.g., group socialization theory), but increased child-parent conflict also drove increases in association with deviant peers (e.g., stage-environment fit theory), which indirectly

influenced beliefs about risk behavior. Though that study provided some support for these theories, Pardini and colleagues did not include a measure of actual risk behavior, rather they included a latent construct about *beliefs* of risk behavior. Furthermore, their sample only included males. Inconsistencies across studies in the way in which samples are composed, constructs created, and measures sampled has led to a gap in the literature with regard to reciprocal influences of parents, peers, and risk behavior.

Individual and Peer Risk Behavior and Child-Parent Relationship Constructs

The way in which constructs are modeled when studying associations across time influences the substantive interpretation of the findings. For example, the expression of risk behavior across different developmental stages may appear differently from early adolescence to late adolescence, with an increase in frequency and type of risk (Arnett, 1992; Byrne, Miller, & Schafer, 1999; Steinberg, 2008). Behaviors such as fighting may be more prevalent in early adolescence whereas risks with cumulative negative effects (e.g., substance use) may lead to engagement in a variety of separate but related behaviors (e.g., reckless driving, risky sexual activity, and skipping school). Similar to changes in risk behavior across adolescence, adolescent relationships may change over time. For example, adolescent relationships change as a function of developmental stage (i.e., increased proportion of time spent outside the home), resulting in increased differentiation in adolescent relationships (child-parent relationship functions are increasingly fulfilled in peer relationships; Collins & Laursen, 2004; Nickerson & Nagle, 2005). A research design that includes measures of parent, peer, and risk sampled at multiple time points may provide insight into the interrelated developmental nature of these constructs, consistent with developmental theories. Specifically, including parents

and peer environmental variables simultaneously as influences of risk and measured at multiple time points throughout adolescence would allow for direct tests of their individual influence, relative influence, and indirect influence on risk behavior throughout this developmental period. Further, including these variables would allow for tests of whether risk behavior and relationships mutually influence each other across time, supporting reciprocal development. This study sought to address developmental questions regarding risk behavior and parent and peer influences in an early to middle adolescent longitudinal sample.

Research Questions for Current Study

1. Do the constructs Peer Risk Behavior, Individual Risk Behavior, and Child-Parent Relationship Quality demonstrate measurement invariance across early to middle stages of adolescence?

2. Do the constructs Peer Risk Behavior, Individual Risk Behavior, and Child-Parent Relationship Quality demonstrate structural invariance across early to middle stages of adolescence?

> **2a.** Equivalent factor variances?
>
> **2b.** Equivalent factor means (i.e., does Child-Parent Relationship Quality decrease across adolescence)? If not, what are the effect sizes of the latent mean differences?
>
> **Hypothesis:** Based on the stage-environment fit theory, Child-Parent Relationship Quality should decrease throughout adolescence.

3. How are Peer Risk Behavior, Individual Risk Behavior, and Child-Parent Relationship Quality constructs related to themselves and each other across early to middle stages of adolescence (see Figure 1)?

3a. Are the cross-lagged effects (i.e., direct effects between variables [for example, between Peer Risk Behavior at grade 5 and Individual Risk Behavior at grade 6]) between Individual Risk Behavior, Child-Parent Relationship Quality, and Peer Risk Behavior from previous time to future time (e.g., grade 5 to 6) unidirectional, reciprocal, or statistically non-significant?

Hypothesis: Based on group socialization theory (Harris, 1995), Peer Risk Behavior should influence Individual Risk Behavior (see Figure 2). Furthermore, Child-Parent Relationship Quality should not have statistically significant effects on Individual Risk Behavior (once Peer Risk Behavior is accounted for in the model).

Hypothesis: Based on the stage-environment fit theory, there should be less parental influence on Individual Risk Behavior, while Peer Risk Behavior has more influence on Individual Risk Behavior. Furthermore, Child-Parent Relationship Quality and Individual Risk Behavior may have reciprocal influences early on (see Gutman & Eccles, 2007). Last, changes in Child-Parent Relationship Quality may produce changes in Peer Risk Behavior (e.g., increase in child-parent conflict may predict changes in Peer Risk Behavior), but Child-Parent Relationship Quality and Peer Risk Behavior will not have reciprocal influences (see Figure 3).

3b. If there are corresponding unidirectional effects from one construct to another (e.g., Child-Parent Relationship Quality on Individual Risk Behavior from grade 5 to grade 6 and from grade 6 to grade 9), is the magnitude of the coefficients of the unidirectional effects statistically equivalent across time?

Hypothesis: Based on the stage-environment fit theory, there should be greater child-parent conflict early on (lower Child-Parent Relationship Quality), which then decreases and stabilizes throughout adolescence. Therefore, the corresponding coefficients for effects from Child-Parent Relationship Quality to Individual Risk Behavior should not be statistically equivalent across time (i.e., the magnitude of the coefficient from Child-Parent Relationship Quality to Individual Risk Behavior should be greater in early adolescence compared to later adolescence).

3c. If there are reciprocal influences between Individual Risk Behavior and Peer Risk Behavior, is the magnitude of the coefficients of the reciprocal effects within time statistically equivalent (e.g., is Individual Risk Behavior at Grade 5 on Peer Risk Behavior at Grade 6 statistically equivalent to the effect of Peer Risk Behavior at Grade 5 on Individual Risk Behavior at Grade 6)?

Hypothesis: Based on the stage-environment fit theory, peer influence should be stronger than individual influence in middle adolescence (i.e., the magnitude of the coefficient from Peer Risk Behavior to Individual Risk Behavior should be greater in middle adolescence ([i.e., grade 6 to grade 9] compared to early adolescence [i.e., grade 5 to grade 6]).

4. Is the effect of Child-Parent Relationship Quality on Individual Risk Behavior mediated by Peer Risk Behavior (i.e., does Child-Parent Relationship Quality have an indirect effect on Individual Risk Behavior via Peer Risk Behavior)?

> **Hypothesis:** The group socialization theory states that parents do not matter. The stage-environment fit theory states that parents and peers matter, but that due to an increase in conflict in the child-parent relationship during early adolescence, peers play a greater role in shaping personality and development. However, parents may matter in the sense that they affect greater peer affiliation, which, in turn, influences individual behavior (see Van Ryzin et al., 2012). Therefore, it is hypothesized that Child-Parent Relationship Quality will indirectly influence Individual Risk Behavior via Peer Risk Behavior (see Figure 3).

Rationale for Current Study

In this research study, the group socialization theory and the stage-environment fit theory were explicitly tested using three different latent variables (peer risk behavior, individual risk behavior, and child-parent relationship quality) each measured at three time points (grade 5, grade 6, grade 9) in a large, longitudinal sample. The purpose was to fill in gaps from previous research by including latent variables measured consistently within time and across time and by using a latent variable of general risk behavior rather than a specific risk behavior, such as substance abuse (cf., Van Ryzin et al., 2012).

First, the influence of peers versus parents on risk behavior was compared as a test of Judith Rich Harris's group socialization theory against Eccles's stage-environment fit theory. Specifically, Harris theorized that parents do not have an influence above and beyond peers on the socialization of personality and behavior. Eccles's theory, however,

suggests that peers become important during adolescence due to a decrease in the relationship quality between the child and parent (i.e., parents struggle finding the optimal balance between granting freedom and maintaining control over their child). The direct and relative influences of adolescent relationships with parents and peers on adolescent risk behavior were tested in a longitudinal developmental model that incorporated reciprocal relationships and controlled for previous levels of parent and peer relationships.

One assumption that had to be met prior to interpreting findings from the longitudinal models was that the individual risk behavior, peer risk behavior, and child-parent relationship quality constructs were measured in the same way across adolescence. Therefore, tests of factorial invariance were performed prior to investigating developmental relationships in order to assess the degree of similar measurement across different developmental stages of adolescence.

Limitations

The current study used a large longitudinal sample to investigate reciprocal relationships between adolescent risk behavior and parent and peers. Despite a large longitudinal sample, the sample was predominantly a low risk sample with the majority consisting of White study participants and a large proportion of educated study participants (e.g., only 8.2% of the sample did not graduate high school or obtain a GED). The low risk sample may decrease the variance associated with risk behavior and therefore make finding important effects more difficult. A second limitation was the use of adolescent self-report data for the individual and peer risk constructs. Although adolescent self-report data were used so that the individual and peer risk constructs were

based on the same source of information, using multiple sources of information may more accurately represent these constructs. Furthermore, the mother primarily reported the quality of the child-parent relationship. An inclusion of adolescent report may be important when viewing risk behavior from the child's perspective. A third limitation with the current study is that the risk behavior and parent and peer constructs were not sampled at equal intervals. Developmental processes can change rapidly (or slowly) and may not be captured appropriately within the sampled time points. Last, a full inclusion of all risk behavior was not obtained.

Chapter II: Review of the Literature

In this chapter, a review of the literature regarding the study of risk behavior is examined. Risk behavior in adolescence, the prevalence of risk behavior in adolescence, and outcomes related to risk behavior are then discussed. Because risk behavior is a widely studied area of inquiry, different theoretical perspectives regarding its development are covered with a more detailed focus on social theories of risk behavior. Specifically the stage-environment fit theory (Eccles et al., 1993) and the group socialization theory (Harris, 1995) are used as theoretical frameworks for understanding the development of risk behavior. The literature on child-parent relationships and peers and their relational influence on risk behavior are reviewed. A literature review of the current research investigating the interrelatedness of these constructs is discussed. Last, research that is needed in this area including new contributions of this study and what considerations should be taken into account when studying these developmental processes are discussed.

What Is Risk Behavior?

Risk behavior is broadly defined as engagement in negative behaviors that are associated with either undesirable results or harm to future development (Boyer, 2006). Risk behavior is a general latent variable that is composed of psychological traits such as sensation seeking and impulsivity (Zuckerman & Kuhlman, 2000). Sensation seeking is a trait defined by the "seeking of varied, novel, complex, and intense sensations and experiences, and the willingness to take physical, social, legal, and financial risks for the sake of such experience" (pg., 1000, Zuckerman & Kuhlman, 2000). Sensation seeking has been linked to reckless behaviors in driving, sex, drug use, smoking, alcohol use,

gambling, and vandalism, including a general composite of these risk behaviors (Arnett, 1996). Impulsivity is defined as "the tendency to enter into situations, or rapidly respond to cues for potential reward, without much planning or deliberation and without consideration of potential punishment or loss of reward" (pg., 1000, Zuckerman & Kuhlman, 2000). Risk behavior includes a set of interrelated behaviors including thrill-seeking, reckless, rebellious, and antisocial behaviors (Gullone et al., 2000). Thrill-seeking type behaviors may either be socially acceptable with life threatening consequences (e.g., sky diving) or socially unacceptable with non-life threatening consequences (e.g., entering a school competition). Reckless type behaviors are risky sexual behaviors, reckless and unsafe driving (e.g., high speeds, no seat belt, drunken driving) and often associated with the most dangerous outcomes, such as disease, injury, or even death. Rebellious type behaviors include underage drinking, smoking, taking drugs, or staying out late. Last, antisocial type behaviors include cheating, bullying, or even suicide. In this study, risk behavior represents a single latent variable that accounts for the covariances among three interrelated behaviors (i.e., reckless, rebellious, and antisocial) that may occur at any frequency (e.g., only once or many times).

Adolescence and Risk Behavior

Adolescence is marked by normative experimentation, autonomy, independence, identity development, and changes in biological development (Lightfoot, 1997; Michael & Ben-Zur, 2007; Mulye et al., 2009). Adolescents navigate a new set of freedoms, responsibilities, and novel experiences, leaving them especially vulnerable to engaging in risk behavior (Crone, Bullens, van der Plas, Kijkuit, & Zelazo, 2008; Reyna & Farley, 2006). Thus, not surprisingly, the incidence of risk behaviors substantially increases in

middle to late adolescence (Crone et al., 2008; Steinberg, 2005; 2008), resulting in significant health, economic, psychological, and academic problems (Reyna & Farley, 2006), including short-term and long-term consequences on individuals and society at large.

Prevalence of Individual Risk Behavior in Middle School and High School

According to the 2010 Census, there were 42,717,537 adolescents' ages 10 to 19 years living in the United States, representing about 14% of the total population.

Middle school. The Center for Disease Control and Prevention (CDC) has established a Youth Risk Behavior Survey (YRBS) for middle school adolescents in grades 6 through 8 called the *Middle School Youth Risk Behavior Survey* (Shanklin, Brener, McManus, Kinchen, & Kann, 2007). The survey has been used every two years to collect prevalence data on a variety of self-reported risk behaviors. According to the 2005 Middle School YRBS summary report, 10 states and 11 cities conducted a middle school YRBS. The 2005 report summarizes results from five state and eight local middle school surveys with weighted data in 2005. A two-stage cluster sample design was used to produce representative samples with student samples ranging from 1,079 to 2,906, and response rates ranging from 76% to 92%. According to the survey, "given the low prevalence of most risk behaviors among middle school students, the time frame used to measure behaviors related to unintentional injuries and violence, suicide attempts, alcohol and other drug use, and sexual behaviors is limited to lifetime rather than past 12 months or past 30 days" (pg. 2, Shanklin et al., 2007). Risk behavior prevalence rates are reported as medians and ranges in the form of percentages for states and cities by grade. The researcher only listed the states for comparison (see Table 1).

According to the YRBS survey the overall prevalence rate of reckless behaviors increased throughout middle school (see Table 1). For example, for those riding in a car, approximately 10.3% [9.2%–11.6%] in 6th grade did not wear a seatbelt whereas approximately 11.4% [9.5%–16.7%] in 8th grade did not wear a seatbelt. The proportion of 6th grade students who rode in a vehicle with a drinking driver was approximately 24.1% [11.9%–28.2%]; that percentage increased by more than 50% in 8th grade to 37.2% [26.1%–54.5%]. Reckless sexual behavior was mixed. For example, the rate of middle school students who had ever engaged in sexual intercourse at least once increased from 11.2% (no range reported) in 6th grade to 18.1% [17.9%–18.2%] in 8th grade. However, 8th grade students reported similar condom use during their last sexual intercourse, 73.3% [69.2%–77.3%] compared to 7th grade students' use of condoms, 70% (no range reported, 6th grade data not available).

The prevalence rate of all rebellious behaviors increased throughout middle school (see middle of Table 1). The percentage of students from 6th through 8th grade who had reported ever having alcohol (lifetime use) increased from 26.2% [23.3%–27.5%] to 48.7% [43.5%–51.9%]. Lifetime cigarette use increased from 19.9% [16.1%–23.7%] in 6th grade to 37.3% [29.6%–37.7%] in 8th grade, while over the same period current smokeless tobacco use increased from 4.2% [3.6%–4.8%] to 6.5% [4.3%–8%]. There was nearly a fourfold increase for those who had ever used marijuana in 8th grade to 17.3% [12.7%–21.3%] from 6th grade use of 5.4% [3.7%–5.5%]; and nearly a 50% increase for those who had ever used cocaine use from 6th grade, 3.1% [1.8%–3.4%] to 8th grade, 4.6% [3.7%–6%]. Lifetime inhalant use increased from 12.7% [11.1%–13.9%] to 14.4% [12.7%–16.7%].

Likewise, risk behaviors related to antisocial behavior increased throughout middle school (Table 1). During middle school the percentage of students who had ever been in a physical fight increased from 56.5% [48.2%–57.4%] in 6th grade to 60.7% [56.4%–69%] in 8th grade. The percentage of students who ever carried a weapon (e.g., gun, knife, or club) increased from 33.2% [30.3%–49.6%] in 6th grade to 42.6% [39.4%–54.3%] in 8th grade. Those who had ever attempted suicide increased from 6.3% [4.2%–7.8%] to 9.6% [6.9%–11.6%] during middle school.

Overall, all risk behavior increased throughout middle school, though some of the consequences related to risky sexual behavior may have been offset by alternative methods (e.g., birth control use).

High school. The CDC also administers the YRBS every two years to adolescents in grades 9 through 12. Data are collected concerning the prevalence rate of the same self-reported risk behaviors reported in the *Middle School Youth Risky Behavior Survey*. According to the 2013 High School YRBS summary report, 42 states and 21 large urban school districts completed the survey for grades 9 through 12 (Kann et al., 2014). The risk behavior prevalence rates are reported as medians and ranges in the form of percentages at the national level for each grade. State and large urban school districts only list medians for high school aggregated as one group. For this study, I only listed the national level prevalence rates for comparison (see Table 1). For the 2013 national YRBS, 13,633 questionnaires were completed in 148 public and privates schools. The overall student response rate was 77%. A three-stage cluster sample design was used to produce a nationally representative sample of students in grades 9–12. Only three items were asked differently from the middle school YRBS–the frequency of riding in a car

with a driver who had been drinking alcohol one or more times during the 30 days before the survey, the frequency of carrying a weapon on at least 1 day during the 30 days before the survey, and in a physical fight one or more times during the 12 months before the survey (these were lifetime choice phrased in the middle school YRBS). Thus, the majority of items can be compared across grades.

The prevalence rate of most reckless behaviors increased throughout high school, although the rate increases differed from middle school and some risk behaviors actually declined some in high school. For those riding in a car, approximately 8.5% [6.8%–10.6%] in 9th grade did not wear a seatbelt whereas approximately 6.7% in 12th [5.3%–8.5%] grade did not wear a seatbelt, representing an overall decrease in this risk behavior. The proportion of 9th grade students who rode in a vehicle with a drinking driver 30 days before the survey was approximately 19.4% [17.3%–21.7%], whereas in 12th grade 24.2% [21%–27.8%] of students rode with a drinking driver in the past 30 days before the survey. The mortality rate for adolescents involved in motor vehicle accidents for ages 10–14 years and 15–19 years was 3.4 and 23.6 per 100,000, respectively. Motor vehicle accidents are a leading cause of death for adolescents and young adults (ages 10–24 years; Mulye et al., 2009).

Additional information collected by the CDC on the high school YRBS indicated that reckless sexual behaviors increased throughout high school. The percentage of high school students who ever had sexual intercourse increased from 30.0% [27.3%–32.9%] in 9th grade to 64.1% [59.7%–68.3%] in 12th grade. The trend for condom use altered after middle school. Condom use declined throughout high school. Students who used a condom during sexual intercourse decreased from 62.7% [56.3%–68.7%] in 9th grade to

53% [49.4%–56.5%] in 12th grade. Despite the increase in risky sexual behavior, unintended pregnancy may have been offset by the increased use of alternative preventative methods (e.g., birth control medication – increased from 11.4% in 9th grade to 23.7% in 12th grade).

The prevalence rate of all rebellious behaviors increased throughout high school. The percentage of students from 9th through 12th grade who ever had alcohol increased from 55.6% [52.3%–58.9%] to 75.6% [71.9%–79.0%]. Lifetime cigarette use increased from 31.7% [28.7%–34.8%] in 9th grade to 48.1% [44.4%–51.8%] in 12th grade, while again current smokeless tobacco use also increased slightly increase over this same period from 7.3% [8.5%–14.7%] to 9.4% [13.9%–19.7%]. Those who had ever used marijuana in 9th grade was approximately 30.1% [27.1%–33.2%], which increased to 48.6% [44.1%–53.2%] in 12th grade. For those who had ever used any form of cocaine, approximately 4.4% [3.4%–5.6%] of 9th grade students had used it, whereas approximately 7.1% [5.7%–8.7%] of 12th grade students had used some form of cocaine. Lifetime inhalant use decreased from 10.1% [8.4%–12%] to 8.1% [6.3%–10.4%].

Risk behaviors related to antisocial behavior were mixed though the majority decreased throughout high school. The percentage of students who reported having carried a weapon on at least 1 day during the 30 days before the survey increased from 17.5% [15.6%–19.6%] in 9th grade to 18.3% [16.1%–20.8%] in 12th grade. During high school, the percentage of students who reported having been in a physical fight one or more times during the 12 months before the survey decreased from 28.3% [26%–30.7%] in 9th grade to 18.8% [16.5%–21.3%] in 12th grade. Lifetime suicide attempts decreased from 9.3% [8.2%–10.4%] to 6.2% [4.9%–7.8%] during this same period.

Risk behavior summary. Overall, most risk behaviors increased throughout this period. For the most part, the reported frequency of these behaviors increased in high school, which is consistent with previous reports (e.g., Reyna & Farley, 2006; Steinberg, 2008).

Reckless behaviors were mixed. Seatbelt use consistently increased throughout high school. Riding with a drinking driver increased from 9th through 12th grade. Risky sexual behavior including not using a condom increased in high school. Perhaps the most consistent, rebellious behaviors (except inhalant use which has also been associated with antisocial behavior) all increased throughout high school, continuing their trend from middle school. Antisocial risk behavior mostly decreased in high school (e.g., fighting, suicide attempt), except carrying a weapon, which increased in high school (the item was phrased differently in middle school versus high school).

The frequency of risk behaviors were represented in greater percentages for about half of the risk behaviors during high school versus middle school. Higher percentages of risk behavior in middle school included seatbelt use, riding with a drinking driver, carrying a weapon, fighting, suicide attempts, and inhalant use. However, these differences may be due to differences in the way they were sampled (e.g., format of questions) or based on demographic differences (e.g., age differences, national versus state) in sampling. Additionally, these were self-report measures, which may not represent the true prevalence of risk behaviors in the adolescent population.

Individual Risk Behavior Outcomes

Behaviors adolescents engage in have both short-term and long-term consequences. Adolescent risk behaviors can lead to academic failure, school dropout,

negative social relationships, poorer health (e.g., sexually transmitted disease, injury, psychiatric disorders – depression and anxiety), unintended pregnancy, addiction, poorer occupational status, fewer occupational opportunities in adulthood, or even death (Chassin, Pitts, & DeLucia, 1999; Freudenberg & Ruglis, 2007; Lessard et al., 2008; Luster & Small, 1994; Newcomb & Bentler, 1988; Rudasill, Reio Jr., Stipanovic, & Taylor, 2010; Simons-Morton & Chen, 2009). Moreover, certain risk behaviors such as substance use during adolescence can lead to addiction, resulting in long-term negative effects such as poor health, negative social relationships (later friendships or romantic partners), lack of economic opportunities, association with crime, or even psychiatric problems (Arnett, 1992; Ary et. al., 1999; Harris, Duncan, & Boisjoly, 2002; Rudasill et al., 2010; Van Ryzin et al., 2012). Studying potential influences on risk behaviors is important and may reduce some of the negative outcomes associated with those behaviors.

Theoretical Overview

Although the general trend during adolescence is for individuals to increase their engagement in risk behaviors, obviously most children do not engage in risk behavior. Theories from multiple perspectives (e.g., cognitive, emotional, social, genetic, and biological) have been offered to explain individual differences in risk behavior that are most prevalent during adolescence. According to cognitive researchers, adolescent risk behavior may develop due to underdeveloped mental faculties or due to differences in cognitive biases or flawed thinking. Researchers who study emotion as it is implicated in risk research consider emotional regulation and how it affects decision-making. Biological perspectives on the development of risk behavior consider the role of

physiology, particularly sex hormones and its relations to sensation-seeking behavior, and the regulation of the neurotransmitter dopamine, a reward chemical, found in the limbic system of the brain. Biological perspectives also consider structural changes in the brain including neuron density in the frontal lobes. Genetic considerations are tied to all perspectives, as genes are the precursor to life and thus individual behavior. Last, the social developmental perspective, which is the focus of this study, considers the role of socialization in shaping personality traits, which in turn influence the tendency to engage in risk behaviors.

The literature base for individual and peer risk behavior and relationship quality between the child and parent was investigated primarily using Google Scholar. The University of Kansas Libraries search engine was also used to conduct the literature review. Search parameters for the literature review included, "risk behavior," "risky behavior," "risk-taking," "delinquency," "antisocial behavior," "adolescence," "child-parent relationship quality," "attachment," "development of risk," "longitudinal," "peer influence," "parent influence," and "social learning theory."

Theoretical Perspectives on the Development of Risk Behavior

Cognitive perspective. From the cognitive perspective, risk behavior is largely a result of a cognitive underdevelopment. For example, risk behavior occurs more frequently in adolescents compared to adults due to underdeveloped and emerging reasoning skills, processing speed, and memory skills that are not developed enough to deal with evaluating risky decisions and consequences (Boyer, 2006).

Cognitive researchers have studied the development of judgment and decision-making skills in relation to risk behavior (Boyer, 2006). Adolescents are often described

as having a lack of good judgment and decision-making skills because they engage in risk behaviors out of impulse or sensation-seeking tendencies without considering the outcomes.

An alternative cognitive explanation for risk behavior is that adolescents are especially susceptible to cognitive biases called framing effects: The way a choice is presented or "framed" influences how people make decisions. Decisions depend on whether an outcome is framed (perceived) as a gain or a loss (Kahneman, 2011). This framing effect is important during adolescence because the framing of consequences can be viewed in two different ways with different outcomes. For example, an adolescent may view hanging out with friends as resulting in better peer relations, which is seen as a gain. However, this same outcome may be associated with more family conflict, resulting in a loss of privileges, a loss. Furthermore, the effects of these outcomes may reinforce inappropriate behavior or indirectly lead to more inappropriate behavior (e.g., increased family conflict may lead to closer association with risky peers). Alternatively, the outcome (loss of privileges) may actually lead to adherence to appropriate behavior.

Individual differences in adolescent risk behavior may also be explained from cognitive theory. Some adolescents exhibit an optimistic bias. They view their own risks as less likely relative to other same age peers, therefore, some adolescents have a more biased view (Reyna & Farley, 2006). For instance, adolescents who engage in risk behavior like unprotected sex may underestimate their risk of contracting a STD relative to other adolescents who engage in similar behavior. This bias may also be related to a sense of invulnerability (Arnett, 1992). Adolescents are theorized to be cognitively egocentric and have a distorted perspective on personal invulnerability to risk outcomes

(Arnett, 1992). But, some adolescents have a more distorted perspective than others and this degree of distorted perspective may explain individual differences in risk behavior during adolescence.

Emotional perspective. The development of risk behavior has been studied from an emotional perspective. Researchers from this perspective study the influence of people's reactions to emotionally-laden experiences or situations on risk behavior (Boyer, 2006; Caffray & Schneider, 2000; Loewenstein, Weber, Hsee, & Welch, 2001). Increases in positive emotions (e.g., social/emotional enhancements–having a good time, impressing others, and sensation-seeking enhancements–excitement and lack of boredom) with concomitant decreases in negative emotions (e.g., unpleasant affective states–depression, loneliness, and sources of tension–stress and family conflict) leads to an increased probability of engaging in risk behaviors, whereas the reverse leads to a decreased probability of engaging in risk behaviors.

Another important influence on risk behavior that is studied from the emotional perspective is emotional regulation. Emotional regulation is the ability to control emotions. Adolescents who have poorer emotional regulation are more likely to engage in risk behaviors (Boyer, 2006).

One theory that explains the role of emotions in risk behavior is the somatic marker hypothesis (SMH; Bechara & Damasio, 2005). The SMH posits that emotions and feelings are necessarily tied to decisions involving risk behaviors. Furthermore, the connection between emotions and risk behavior become strengthened over time. When an individual does not recall or attend to these connections that were learned over time, he or she is more likely to engage in risk behavior. Experimental studies have used the Iowa

Gambling Task (IGT) to illustrate the SMH. The IGT has individuals choose from one of four card decks, two of which are risky decks (large gain, large loss) and two of which are safe decks (small gain, small loss). Individuals who are emotionally impaired are more likely to choose the risky decks beyond what is expected by chance compared to non-emotionally impaired individuals who disproportionately choose the safe decks, even when both groups are cognitively typical (Kerr & Zelazo, 2004).

Biological perspective. One major area of investigation for the development of risk behavior is within biological neuroscience. Many important changes in brain structure and connectivity occur between childhood and adolescence (Sowell, Thompson, & Toga, 2004). One such change that remains underdeveloped throughout adolescence is continuing myelination of neurons and a reduction of synaptic density in the prefrontal cortex (PFC), resulting in suboptimal efficiency of information processing and cognitive self-regulation (Steinberg, 2007). Individuals with damage to the ventromedial PFC, an area at the bottom of the cerebral hemisphere that is involved in the processing of risk, fear, emotional responses, and decision-making, is associated with increases in impulsivity and risk behavior compared to normal individuals (e.g., Bechara, Damasio, Tranel, & Damasio, 1997) and it is during adolescence that the ventromedial PFC is still developing (Crone et. al., 2008).

In addition to changes in brain structure, there are changes in brain functioning during adolescence. Functional neuroimaging studies have found that when adolescents take risks, there is less activation in the ventromedial and ventrolateral PFC (areas associated with evaluating risks) with more activation in the nucleus accumbens, a reward center in the limbic system (Eshel, Nelson, Blair, Pine, & Ernst, 2007). This

differential activation during adolescence may be due to increased vulnerability to sensation-seeking behaviors and underdeveloped prefrontal areas implicated in risk behaviors.

The increased vulnerability to sensation-seeking behavior may be due to developmental changes in the PFC. During adolescence, developmental changes occur in the dopaminergic system in the PFC, which plays a role in the brain's reward circuitry. There are significant increases in dopamine activity in early adolescence followed by a significant reduction in dopamine activity around puberty, which may lead to greater sensation-seeking behaviors due to a "reward deficiency syndrome" or lack of dopamine activity (Steinberg, 2008).

Sensation-seeking behavior correlates with the emergence of risk behavior during adolescence. The correlation, however, may be explained by physiological changes such as an increased production of sex hormones. The increased production of sex hormones increases the desire for more intense sensations and experiences. Sex hormones are related to a number of risk behaviors such as reckless driving, unsafe sex, alcohol, cigarettes, drugs, theft, and vandalism (Arnett, 1996; Crone et al., 2008).

Last, temperament is considered a biologically based personality trait that is foundational for personality development (Rudasill et al., 2010). Temperament is characterized as an individual's response to the environment and subsumes reactivity and regulation (Thomas & Chess, 1977). Those with high reactivity (i.e., high negative emotionality, fear, frustration, anxiety) and low regulation (i.e., impulse control, attention, task persistence) are typically defined as having a difficult temperament.

Difficult temperament has been associated with engagement in risk behavior (Moore et al., 2005; Wills, Sandy, & Yaeger, 2000).

Social perspective. According to social learning theory, individuals learn behavior within social contexts (Bandura, 1971). Social contexts such as relationships with parents or peers play a role in the development and shaping of behavior, particularly risk behavior. These relationships function as platforms for observing and learning behavior and are important influences for individual behavior. Within these relational contexts, both parents and peer groups interact with the child's cognitive and affective capabilities, which, in turn, influence how the individual interacts with the environment (Bandura 1978). Therefore, an individual's propensity to engage in risk behavior influences the environment he/she exists in, which also influences the environment on the individual.

Individual differences in risk behavior have been linked social contexts. Social learning theory posits that social contexts are important for learning and developing behavior (Bandura, 1971; 1978). Within these social contexts, relationships are important because they provide opportunities to engage in learning and can be powerful motivators of influence. Different theories within a social learning model may explain the development of risk behavior. For example, the group socialization theory (Harris, 1995) and the stage-environment fit theory (Eccles et al., 1993) may explain individual differences in risk behavior via different social relationships.

Group socialization theory. According to Harris's group socialization theory (1995), peers are more important than parents in the shaping of personality. Harris posits that children and adolescents sort themselves into identity-based categories (e.g. age,

gender, and talent). This process of self-categorization leads to identification with a group, and shapes personality through identity formation. Groups serve as a reference for social comparison, creating norms and values, which individuals then use to measure appropriate conduct and attitudes. These attitudes and behavior, in turn, influence their own individual attitudes and behavior (Harris, 1995). Thus, just as groups differ in risk behavior, identification with different groups may explain individual differences in risk behavior across adolescence.

As an example of how this mechanism functions, adolescent risk behavior may be seen as engaging in experiences that are seen as relevant to group identity (Lightfoot, 1997). Yet, within these groups individual differences still exist. Some individuals within the group may be differentiated from one another, above and beyond their differences between groups, by their engagement in extreme risk behaviors (e.g., substance use, vandalism) within the group. Thus, gaining social status within a group by way of engaging in more frequent or more extreme risk behaviors may serve to elevate the individual in the group.

Stage-environment fit theory. A social theory that examines the influence of relationships within both child-parent and peer group relationships is called the stage-environment fit theory (Eccles et al., 1993). Adolescence is a period of increased social comparison, evaluation, and competition and adolescents tend to value independence to handle these changes. Therefore, adolescents need a supportive environment to adapt to these changes. Child-parent relationships are naturally asymmetrical in terms of their diffusion of power and autonomy. Stage-environment fit theory posits that there is a mismatch when the child's increasing desire for autonomy is met with the parents'

struggle to determine a balance between autonomy and control. Child-parent relations are strained. These strained relations may lead to a relational quality characterized by more conflict and less closeness, causing a shift towards riskier peers. These peers may in turn have a strong influence on adolescent behavior, potentially leading to risk behavior. Furthermore, closer associations with peers may result in increased conflict between the child and parent because the parent may lose further control and closeness with their child, which may lead to instability in the relationship. Therefore, peers or the increased conflict in the child-parent relationship may influence risk behavior. However, child-parent relationship quality may continue to influence risk behavior albeit indirectly (mediation) through association with risky peers.

Child-Parent Relationship and Peer Groups in Risk Behavior

Relationships within social contexts provide the basis for learning behavior. The child-parent relationship is considered the first important social influence in the child's life. Peers also play a role as the child ages. Given that the child's parent and peers influence behavior, it is important to understand how these influence risk behavior across adolescence.

Child-parent relationship in risk behavior. The relational quality between parents and children is important for understanding risk behavior from a social learning model.

Attachment. Attachment theory explains how the relational quality between the parent and the child first develops (Bowlby, 1969). In the early years of development, a child seeks a close and positive relationship with their parent. If the parent responds with a close and positive relationship, a secure attachment is formed from which the child will

venture out into the world with well-adjusted and adaptable behavioral tendencies (Bowlby, 1969). Alternatively, if parents are nonresponsive to their child, then this nonresponsiveness can result in an insecure attachment, from which a child will develop maladjusted behavioral tendencies.

The quality of attachment from early childhood links to adolescent relational quality affecting adolescent risk behavior (Berger, Jodl, Allen, McElhaney, & Kuperminc, 2005; Marsh, McFarland, Allen, McElhaney, & Land, 2003). Insecurely attached children have less parental involvement (Barnes & Farrell, 1992), less family bonding (Anderson & Henry, 1994), and less parental control (Coombs & Landsverk, 1988). For instance, insecurely attached adolescents, as opposed to securely attached adolescents, tend to have more relational dysfunction and decreased social competence. These adolescents are more likely to engage in risk behaviors and are at greater risk of developing an externalizing disorder such as delinquency, hostility, or substance use (Allen et al., 1998; Allen et al., 2002; Van Der Vorst, Engels, Meeus, Dekovic, & Vermulst, 2006).

Supporting the association between attachment and risk behavior in a longitudinal sample of 1,012 young adolescents, attachment was negatively related to adolescents' alcohol use. The more an adolescent negatively rated the perception of the quality of the attachment relationship, the higher the likelihood the adolescent engaged in alcohol use. However, an early development of alcohol use also had a negative association with attachment, suggesting that the engagement in risk behavior led to decreased attachment quality (Van Der Vorst et al., 2006).

Parental warmth. The child-parent relationship is often described in terms of parental warmth or parental conflict. Parental warmth, or a positive (close) child-parent relationship, is the extent to which parents support their children, spend time and communicate with them, and are responsive to their needs (Fine, Voydanoff, & Donnelly, 1993). Parental warmth has been found to be negatively associated with risk behavior (Hops et al., 1999; Nash et al., 2005).

In a longitudinal study using data from the National Survey of Children, a positive child-parent relationship throughout adolescence was associated with increases in educational and economic attainment and psychological well-being and decreases in adolescent delinquency (e.g., property damage, carrying a concealed weapon, selling drugs) (Harris, Furstenberg, & Marmer, 1998). A different study summarized two decades of research that reported parental influences on sexual risk behaviors in their children. The summary research found that increases in child-parent closeness led to decreases in adolescent pregnancy (Miller et al., 2001). A close child-parent relationship has also been found to increase temperamental effortful control, "the ability to voluntarily focus and shift attention and to inhibit or initiate behavior, that is important in controlling impulsivity" (Eisenberg, et al., 2005). Therefore, a close child-parent relationship may reduce individual risk behavior via increasing impulse control.

Parental conflict. Parental conflict, or a negative child-parent relationship, on the other hand is the degree to which parents have negative interactions with their child. Parental conflict has been found to be positively associated with risk behavior (Ary et al., 1999). In a longitudinal study of adolescents of ages 13–19 years, Gutman and colleagues (2011) found that conflict was associated with a higher incidence of risk behaviors.

Conflict has also been associated with increases in substance use (Bray, Adams, Getz, &, 2001).

Summary. Generally, findings indicate that a close child-parent relationship is associated with a reduced likelihood of engaging in various risk behaviors during adolescence. However, some research has shown that individual risk behavior and child-parent relationship quality may be mutually related over time (Van Ryzin et al., 2012).

Peer groups in risk behavior. In the context of increased child-parent conflict that is common during adolescence, adolescents may become closer to peers and therefore more vulnerable to peer pressure (Eccles, et al., 1993; Gutman et al., 2011). Although peer pressure can be beneficial, the focus of this study is on association with risky peers. The increased influence of peer groups on adolescents' engagement in risk behaviors and why adolescents develop a relationship with peers can occur for various reasons. First, it is possible that more conflict arises in the quality of the child-parent relationship during adolescence and therefore leads adolescents to seek out close relationships from peers (Gutman et al., 2011). Second, during adolescence parents may find it difficult to determine the level of autonomy to grant their children while adolescents vie for more autonomy causing a mismatch, further motivating adolescents to seek out peers who grant that autonomy (Goldstein et al., 2005). Third, adolescents may choose peers with similar personalities such that those adolescents with a propensity to engage in risk behaviors identify with those with a similar propensity (Baumann & Ennett, 1996; Gardner & Steinberg, 2005). Last, children who are rejected by their peers may gravitate towards more antisocial peers and therefore engage in more risk behavior (Dishion, Patterson, Stoolmiller, & Skinner, 1991; Laird, Jordan, Dodge, Petit, & Bates,

2001).

Most research examining peer groups and individual risk behavior revolves around alcohol or substance use. In research examining peer group influence on adolescent risk behavior, the consumption of alcohol, marijuana, and tobacco was associated with peer group behavior, with the strongest relations for alcohol use (Clark & Loheac, 2007). Using a longitudinal latent growth curve model in a sample of 363 Hispanic and Caucasian adolescents, Curran and colleagues (1997) found that changes in adolescent alcohol use were related to changes in peer alcohol use over a three-year period, indicating a relation between individual risk behavior and association with risky peers.

One reason that peer groups may have a strong impact on individual risk behavior is because peer groups may decrease a sense of personal responsibility resulting in increased vulnerability to risk behavior (Wallach et al., 1962). In an experimental study of 306 individuals in age groups of 13–16, 18–22, and 24–older, individuals were randomly assigned to be either alone or with two same-aged peers to complete several tasks designed to measure risk taking. Participants completed a risk preference scale using the Benthin Risk Perception Measure. They were asked to rate how the risks compared with the benefits of the activity (e.g., having sex without a condom, riding in a car driven by someone who has been drinking, trying a new drug that one does not know about, breaking into a store at night and stealing something that one really wants, and driving over 90 mph on the highway at night). Participants also completed a risky decision making questionnaire called the Youth Decision Making Questionnaire in which they were presented with a hypothetical dilemma involving a risky decision (e.g.,

allowing friends to bring drugs into one's home, stealing a car, cheating on an exam, shoplifting, and skipping work without an excuse). Last, participants completed a behavioral task (video game called Chicken) measuring risk taking (Gardner & Steinberg, 2005).

Overall the researchers found that participants in groups versus being alone took more risks, focused more on benefits and less on the consequences of risk behavior, and made risker decisions. Moreover, the effect of peers on individual risk behavior was stronger in adolescence versus older ages with risk behavior generally decreasing with age. For example, adolescents were more likely than adults to take more risks on the risk-taking behavioral task (effect size = .25) and to select the riskier course of action on the risky decision-making questionnaire (effect size = .28). Also, adolescents in groups versus being alone took more risks during the risk-taking behavioral task (effect size = .22), focused more on benefits versus costs of risks (effect size = .11), and selected riskier courses of action in the risky decision-making situations (effect size = .15). The findings suggest that adolescents become more susceptible to peer group influence versus simply having more opportunities to engage in group risk taking than do adults, which may account for the higher proportion of risk taking observed during adolescence.

Further evidence of peer influence on individual risk behavior was demonstrated in a trial of alcohol use prevention. In this study, 1,804 adolescents in grades 7 through 9 were investigated to determine if peer groups influenced adolescents' drinking more or if individuals via peer selection sought out those who were similar in risk tendency (Sieving et al., 2000). Latent variable models investigated the direction of influence between participant alcohol use and friend drug use throughout Grades 7 through 9. Alcohol use

among young adolescents was related more to peer influence than it was to peer selection as indicated by the higher levels of friends' drug use that led to increased alcohol use but not vice versa. Based on these findings, adolescent alcohol use was a consequence of the influence of risky peer groups rather than adolescents seeking out similar risky peers. The influence of risky peer groups on individual risk behavior may be greater and more influential than individual risk behavior effects on peer group selection.

Summary. There are various reasons adolescents may become more vulnerable to risk behavior during adolescence. There is evidence indicating that peer groups influence individual risk behavior. However, it is uncertain whether these influences are simply influenced by peer groups or are more likely the result of struggling child-parent relations, which, in turn, affect the influence of peer groups on individual risk behavior. Furthermore, strained child-parent conflict may be exacerbated by increased peer influence on adolescent risk behavior, while parent influence remains negligible (or absent). It is uncertain whether individual risk behavior and association with risky peers mutually influence one another or if one is more important in predicting changes in behavior than the other. The inclusion of both parent and peer environmental variables in the development of risk behavior is important for understanding environmental influences throughout the stages of adolescent development.

Child-parent relationship and peer group in risk behavior. The combination of parent and peer environmental influences provides a richer understanding of risk behavior in adolescence since behavior develops within these social contexts. The socialization that occurs within child-parent relationships may provide initial normative personality development but it is during adolescence that peer contexts become

increasingly important for socializing what is acceptable and what is not (Harris, 2009). The following studies examined the social influence of child-parent relationship quality *and* peer groups on risk behavior throughout adolescence.

In a study of 508 adolescents ages 12–18 years, Dekovic (1999) used hierarchical multiple regression to study the development of individual risk behavior (18-item scale of oppositional and aggressive behaviors, using hard drugs, beating someone up, shoplifting) and child-parent and peer relationships. Attachment to parents (quality of communication, degree of trust, and alienation in parent-adolescent relationship --"I tell me mother/father about my problems and troubles") had a small but statistically significant association with risk behavior ($\beta = -.09$), controlling for age, gender, risk factors (i.e., low achievement motivation, low self-esteem, high strictness, low support, association with deviant peers, extreme peer orientation), and protective factors (i.e., active coping, high academic achievement, monitoring, acceptance by peers, attachment to peers). Attachment to peers (i.e., positive quality of communication and the high degree of trust in the relationship with peers) also had a small but statistically significant association with risk behavior ($\beta = -.11$), controlling for age, gender, risk factors, and protective factors. Association with deviant peers had a statistically significant and large association with risk behavior ($\beta = .68$), controlling for age, gender, risk factors, and protective factors. Thus, association with deviant peers had a stronger influence on the development of risk behaviors than did parent or peer attachment, supporting a stronger overall developmental influence (since age was controlled) from peers instead of parents.

In another study (Michael & Ben-Zur, 2007), rather than examining a wide range of ages, the researchers simply examined an older adolescent population. In a sample of

269 Israeli adolescents ages 16–18 years, a path analytic model was tested with social factors (e.g., adolescent-parent relationship, orientation towards peer group) and affective factors (e.g., depression, aggression, social desirability) as explanatory variables of risk behavior, controlling for gender, perceived economic status, and social desirability. Child-parent relationship quality was negatively associated with risk behavior whereas peer groups (e.g., conformity to group pressure, group values) were positively associated with risk behavior. In the path model, child-parent relationship quality had a direct effect (β = -.20) on risk behavior and peer group had a direct effect (β = .19) on risk behavior. In addition, peer groups influence on risk behavior was partially mediated by aggression. In other words, peer group had a direct effect on risk behavior in addition to an indirect effect on risk behavior via aggression. Overall, the influence of child-parent relationship quality and peer group on risk behavior was relatively the same. This finding differed somewhat from the previous study (i.e., Dekovic, 1999) in which peer groups had a much stronger influence on risk behavior than did child-parent relationship quality (though attachment to parents versus attachment to peers was relatively the same on risk behavior in Dekovic, 1999).

A third research study compared the relative effects of child-parent relationship quality versus peer groups as influences on adolescent risk behavior (measured by the Venturesomeness Inventory, Eysenck & Eysenck, 1978) in a sample of 1,826 adolescents in 7th and 9th grades (Wills et al., 2004). Child-parent relationship quality was negatively associated with risk behavior at 7th grade (β = -.21) and 9th grade (β = -.24), whereas peer groups were positively associated with risk behavior at 7th grade (β = .13) and 9th grade (β = .10). In other words, higher levels of parental closeness were associated with

decreases in risk behavior whereas higher levels of peer closeness were associated with increases in risk behavior. Moreover, the relative magnitude was greater at both grades for child-parent relationship quality than peer group on risk behavior, which was somewhat different from previous studies that found that peer groups were either more important (e.g., Dekovic, 1999) or relatively the same (e.g., Michael & Ben-Zur, 2007) on the influence of adolescent risk behavior.

In a fourth study, Kim, Kwak, and Yun (2010) investigated the relative influence of child-parent relationship versus peer group on adolescent risk behavior (alcohol and tobacco use) in a sample of 3,188 junior high school South Korean students. Participants included in the study were asked how many times they had drunk and/or smoked during the past year, which was then used to gain a frequency count that could be used to examine the effects of peers and parents on the amount of substance use. The parental variables included parental attachment (i.e., perception of positive relationship with parents) and parental supervision (i.e., perception of parental supervision of their behavior). The peer variables included differential association--peer delinquency (e.g., how many of your friends were "tough at school," "arrested," etc.), differential association--intensity ("I place great value on my reputation from my close friends"), peer attachment (i.e., closeness to friends), and peer substance use (i.e., number of friends who drink or smoke). The perception of a positive child-parent relationship ($\beta = -.12$) and parental supervision ($\beta = -.22$) both had statistically significant influences on risk behavior, while controlling for gender, age, SES, and family status. The peer variable, differential association--intensity had a statistically significant influence on risk behavior ($\beta = .18$), controlling for gender, age, SES, and family status. The parental variables were

associated with decreases in risk behavior while the peer variable related to reputation appraisal by peers was associated with increases in risk behavior. Furthermore, the influence of the quality of the child-parent relationship on risk behavior was relatively consistent with the influence of peers on risk behavior in this different sample.

A fifth research study investigating the relative influence of child-parent relationship quality versus peer groups on risk behavior in sample of 196 adolescents (Ary et al., 1999) differed from the previous four studies because this longitudinal study included latent variables. The adolescents in this sample had a mean age of 15.98 years with data collected across three consecutive years (though not the same variables at each of the three consecutive years). A latent risk behavior variable was indicated by adolescent reports of antisocial behavior, high-risk sex, academic failure, and substance use. This latent variable accounted for approximately 67% of the covariance among the indicators. Other latent variables included in the study were Family Conflict (i.e., child-parent conflict) and Positive Family Relations (i.e., child-parent closeness) measured at Time 1, and Inadequate Parental Monitoring and Peer Deviance (i.e., peer group) measured at Time 2. The Risk Behavior factor was measured at Time 3 only. The latent variable Positive Family Relations at Time 1 was regressed on the Family Conflict latent variable at Time 1 ($\beta = -.43$). Positive Family Relations at Time 1 had a negative direct effect on Inadequate Parental Monitoring at Time 2 ($\beta = -.23$). Peer Deviance at Time 2 was regressed onto Inadequate Parental Monitoring at Time 2 and had a positive direct effect ($\beta = .38$). Both Inadequate Parental Monitoring ($\beta = .17$) and Peer Deviance ($\beta = .66$) had positive direct effects on Risk Behavior at Time 3. Positive child-parent relations were associated with more monitoring, which in turn led to risk behaviors. Nevertheless,

peer groups had a very large effect on risk behavior. Moreover, families with high levels of child-parent conflict concomitant with low levels of positive child-parent interactions were more likely to lead to a social environment characterized by low parental monitoring and increased association with deviant peers. The effects of inadequate parental monitoring and association with deviant peers led to an increase in risk behaviors at Time 3. These findings support the importance of positive child-parent interactions and the influence it has on associating with deviant peers, which in turn, affects risk behaviors due to increased influence from peers. The findings also show that increased child-parent conflict (with decreased child-parent positive interaction) reduces the adequacy of parental monitoring in preventing association with risky peers. This study combined latent variables into a longitudinal framework to better understand the relationships among important environmental variables. However, this study did not include the same variables sampled at multiple time points, foregoing the opportunity to control for previous levels of each influence. The group socialization theory (Harris, 1995) however, was not supported in this study as child-parent relationship quality indirectly affected risk behavior via association with deviant peers. Thus, parents, to some degree, were actually important. The stage-environment fit theory was not adequately captured in this study due to time sampling of the constructs at only one point. However, some of the effects found in early adolescence (high conflict/low closeness in child-parent relationship quality) seemed to suggest that these strained relations drove adolescents to rely on deviant peers.

Similar to the previous study (e.g., Ary et al., 1999), this sixth study, a longitudinal school-based study, compared the relative influence of child-parent

relationship quality and peer groups on risk behavior (Nash et al., 2005). This study included a longitudinal sample of high school adolescents' (N = 2,573) with variables lagged across three time points (though not the same variables at each of the sampling periods). Family Environment (i.e., child-parent closeness), which was measured in 10th grade, consisted of acceptance by parents, parental monitoring, and communication with parents. Peer Influence (i.e., peer group), which was measured at 11th grade, represented perceived approval of alcohol use among friends. Self-efficacy, also measured at 11th grade, measured the extent to which the adolescent believed they could exercise self-control by abstaining from drinking under various conditions. Stress was measured at 12th grade and it assessed the occurrence of potentially stressful events and the degree to which any such events had troubled the adolescent. Last, Risk Behaviors were assessed at 12th grade and consisted of alcohol frequency, quantity, and alcohol related problems (e.g., tolerance, memory lapses, personal injury, physical fights, missed school or work).

Family Environment had direct effects on Peer Influence (β = -.29) and Risk Behaviors (β = -.09). Family Environment had indirect effects on Risk Behaviors via Peer Influence, Self-Efficacy and Stress. Peer Influence also had direct effects on Risk Behaviors (β = .47). The influence of peers on risk behavior was of greater magnitude than the influence of the child-parent relationship, similar to the Ary and colleagues (1999) longitudinal study. Moreover, a better child-parent relationship was associated with a decrease in risk behaviors whereas deviant peers were associated with increases in risk behaviors. However, positive parent-child interactions, adequate parental monitoring, and acceptance, were associated with decreased risk behavior through a decreased influence of peers on adolescent risk behavior. Stated differently, the influence of a close

child-parent relationship on reducing risk behaviors was mediated by peer influence, or by the parent limiting the child from interacting with peers who engage in risk behavior, thereby limiting risk behavior. Last, a positive or close child-parent relationship reduced risk behaviors by increasing self-efficacy and reducing stress, that is, self-efficacy and stress mediated the effect of a close child-parent relationship on risk behavior. Overall, the results were similar to previous findings of relatively stronger influence from peers than from the child-parent relationship on risk behaviors. The child-parent relationship was more important in influencing association with deviant peers than with directly influencing individual risk behavior.

An additional longitudinal study differed from the previous two longitudinal studies (e.g., Ary et al., 1999; Nash et al., 2005) because this study investigated the relative influence of child-parent conflict and delinquent peers on changes in adolescent males' beliefs about delinquent behavior using the same variables at each time point, across five consecutive years, to understand how socialization influences change across early to middle adolescence (Pardini et al., 2005). These latent reciprocal relations were studied using sample data ($N = 481$) from the Pittsburgh Youth Study for grades 6th through 11th whose ages ranged from a mean age of 10.9 years to a mean age of 16.5 years. A cross-lagged latent panel model was constructed for variables Family Conflict, Deviant Peers, and Deviant Beliefs from Time 1 (6th grade) to Time 6 (11th grade). Early on, Increased Family Conflict at 6th grade increased Deviant Beliefs at 7th grade ($\beta = .14$) and similarly increased Deviant Peers [6th grade to 7th grade ($\beta = .10$), 7th grade to 8th grade ($\beta = .10$), and from 8th grade to 9th grade ($\beta = .12$)]. Deviant Beliefs were not related to changes in Family Conflict. Across all grades, increases in Deviant Peers

increased subsequent increases in Deviant Beliefs (β = .19, .24, .14, .16, .20), and increases in Deviant Beliefs were related to subsequent increases in Deviant Peers from 9th grade to 10th grade (β = .13) and from 10th grade to 11th grade (β = .16).

Overall, the research results indicated that child-parent conflict only directly influenced changes in deviant beliefs in early adolescence whereas changes in association with deviant peers resulted in later increases in delinquent beliefs across all time points. Moreover, changes in delinquent beliefs at 9th grade began influencing changes in association with deviant peers at subsequent grades, indicating that more tolerant beliefs about delinquent behavior was associated with increases in riskier peers. This study sheds light on the fact that what adolescents believe to be tolerable or acceptable as behavior is socialized by parents, but more so, by peers throughout adolescence. In addition, the finding that beliefs about risk behavior can influence peer groups, but not child-parent relationship quality, indicates that peers and beliefs about risk behavior is a reciprocal relationship (not unidirectional) in the latter stages of adolescence.

Last, another longitudinal study including latent variables sampled at each time point was conducted in an ethnically diverse sample (N = 998) to investigate child-parent relationship and peer group as influences on risk behavior from early adolescence (age 12) to early adulthood (age 23) to better understand the socialization of risk behavior (Van Ryzin et al., 2012). A cross-lagged latent panel model was created with variables Family Relationship Quality, Parental Monitoring, Deviant Peer Association, and Substance Use sampled at ages 12, 13, 15, 17, and Substance Use also represented as an outcome variable at age 23. Control variables included SES, gender, ethnicity, and GPA.

Family Relationship Quality at ages 12 and 15 was associated with increases in Parental Monitoring at ages 13 and 17, respectively. Parental Monitoring at age 12 was associated with decreases in Deviant Peer Association and Substance Use at age 13. Parental Monitoring at ages 13 and 15 was associated with positive changes in Family Relationship Quality at ages 15 and 17, respectively.

Family Relationship Quality at ages 13 and 15 was associated with a reduced likelihood of engaging in Substance Use at ages 15 and 17, respectively. An increase in Deviant Peer Association, however, was associated with increased likelihood of engaging in Substance Use across all ages, at ages 15 and 17 the relative influences of Deviant Peer Association and Family Relationship Quality on Substance Use, were similar in magnitude. Last, Deviant Peer Association and Substance Use had reciprocal relations across all ages, with positive increases in one associated with positive increase in the other.

In addition, Parental Monitoring at ages 12 and 13 was associated with decreased likelihood of Substance Use at ages 15 and 17 via Deviant Peer Association at ages 13 and 15, all respectively. Family Relationship Quality at age 15 indirectly influenced changes in Substance Use at age 23 via Deviant Peer Association at age 17.

The findings indicate that association with deviant peers remains a consistent predictor of changes in risk behavior and vice versa, across all ages, whereas child-parent relationship quality emerged as a predictor of changes in risk behavior only in later adolescence. Moreover, when association with deviant peers and child-parent relationship quality both influenced changes in risk behavior, the influence was relatively the same.

Last, child-parent relationship quality and parental monitoring indirectly influenced substance use via selection of peer groups.

Summary. The literature indicates that the influence of the quality of child-parent relationship and the influence of peer groups are both important for predicting individual risk behavior. In some samples, child-parent relationship quality was a stronger predictor than was peer group on risk behavior (e.g., Wills et al., 2004) or relatively the same (Kim et al., 2010; Michael & Ben-Zur, 2007). In a different study the influence of peers on risk behavior was greater than child-parent relationship (Dekovic, 1999). In the longitudinal studies that investigated the relative influence of child-parent relationship versus peer group on individual risk behavior, the peer group appeared to be stronger and relatively consistent compared to child-parent relations across adolescence (Ary et al., 1999; Nash et al., 2005; Pardini et al., 2005) except in the Van Ryzin and colleagues study (2012), in which child-parent relations were directly related to risk behavior in mid-to-late adolescence and indirectly related to risk behavior in young adulthood. The influence of the child-parent relationship was still important for shaping individual risk behavior both directly and indirectly via its influence on peer groups.

Needed Research

The current literature is not explicitly clear on which relational influences affect risk behavior and at what stages of adolescence. Furthermore, these dynamic social relationships and their influence on behavior need to be guided by a strong theoretical background that takes into account multiple sociological theories, not just an overarching theory that presumes relationships are important. It is obvious relationships in all facets of life are important. What needs to be better understood is how these relationships

interrelate over time and how they affect each other in a developmental model. Ideally, the different influences could be modeled as latent constructs and sampled at multiple time points within a longitudinal sample. Moreover, rather than studying a specific risk, it is important to consider a risk behavior construct that captures the constellation of risks typical in adolescence. Last, unambiguous measurement of these constructs is important so that individual differences research is based on construct-specific effects, not measurement-specific artifacts. Many of the previous studies had aspects of this research design, but including all of the aspects in one study may help clarify these dynamic relational associations within an adolescent period of development.

Methodological Considerations

Longitudinal structural equation modeling. The use of longitudinal structural equation modeling has led to a refined understanding about the unfolding events of psychological constructs (Little, 2013). Structural equation modeling (SEM) is an analytic method to understand psychological constructs using latent variables rather than observed variables, therefore, ridding the constructs of unreliable measurement error (Keith, 2006). SEM used in a longitudinal framework models may be used to understand changes and processes of change over time. Four dimensions of change that can be modeled in a longitudinal framework are, (1) the standing in a distribution of individual-differences (2) the mean level of a group or typical score in a group, (3) the dispersion in the distribution or variance, and (4) within-person changes (Little, 2013).

In particular, longitudinal SEM panel models are statistical models used to understand interindividual change, that is, theoretical constructs are used to explain changes in the standing of a distribution of individual-differences in the same or different

construct(s) at a later point in time. These explanations are based on individual differences formed from the construct's group mean and group variance at the latent level. Panel modeling designs provide greater validity for supporting the directionality and causal aspects of direct (predictor to outcome) and indirect effects (predictor through another variable to outcome; Little, 2013). Additionally, longitudinal panel models provide a more robust measure of the construct as it is being measured at multiple points in time. Longitudinal panel modeling also permits factor variance and factor mean (i.e., score on average increased or decreased) comparisons across time. Although questions of intra-individual change, such as within-person growth or decline, are better modeled using multilevel models or latent growth curve modeling (Little, 2013), longitudinal panel models provide strong statistical support in answering questions concerning interindividual differences and change in those differences (i.e., how changes in individual variables result in changes in the other variables).

Longitudinal factorial invariance. In order to proceed with tests of interindividual differences across time, the constructs must be tested for longitudinal factorial invariance (Little, 2013; Little, Preacher, Selig, & Card, 2007). Longitudinal factorial invariance consists of a series of increasingly restrictive sets of tests that are applied to parameters (e.g., factor loadings and intercepts) on the model. These tests explicitly examine the degree to which the constructs in the sample are being identified the same across time. Evidence of longitudinal factorial invariance confirms that the latent construct consists of the same behaviors in the same general proportions even at different developmental periods.

In tests of longitudinal factorial invariance, two levels of invariance can be tested, the measurement level and the structural level. At the measurement level (i.e., measurement invariance), if invariance is violated, any observed longitudinal effects of the latent variables could be contributed to artifacts of the measurement process, and not to true latent differences. For instance, an indicator may be overrepresented in a latent construct at an earlier developmental period, therefore tapping into a slightly different psychological phenomenon than the latent construct at later time points where the given indicator plays less of a role. Because the makeup of the latent variable has changed, it is difficult to isolate the cause of any effects attributed to that latent variable. In addition to measurement invariance, at the structural level, structural invariance can test equivalence of the latent parameters (e.g., factor variances and factor means) across time to answer theoretically-driven questions pertaining to developmental heterogeneity and the relative average of the true construct over time.

Mediation and cross-lagged. Within this longitudinal SEM framework, tests of mediation (indirect) effects (i.e., child-parent relationship quality may affect individual risk taking via association with risky peers) can be assessed (Cole & Maxwell, 2003). These tests are well suited for longitudinal SEM panel models because they can be tested at multiple points in time for the same set of constructs, increasing the validity of the findings (Little, 2013; Maxwell & Cole, 2007). Full longitudinal mediation requires at least three time points of measurement and is therefore a more thorough test of indirect effects since these effects can be replicated across time. Last, latent variable longitudinal panel models permit tests of reciprocal effects. Modeling reciprocal (bidirectional) effects

allows a direct test of reciprocal determinism between individual risk behavior and child-parent relationship and individual risk behavior and peer relationships.

The stage-environment fit theory can be tested via a developmental relations model involving parents and peers on risk behavior. For example, increased child-parent conflict during adolescence may result in increased affiliation with risky peers, which, in turn, may influence individual risk behavior. However, a reciprocal influence between individual risk behavior and peer risk behavior can be tested, where increases in peer risk behavior result in increases in individual risk behavior, and vice versa. Similarly, increases in child-parent conflict may result in increases in individual risk behavior, supporting a reciprocal relational process, which is consistent with social learning theory.

Harris's group socialization theory can also be explicitly tested whereby it is expected that only peer risk behavior should explain changes in individual risk behavior, absent any child-parent effects.

Demographic influences. Risk behavior varies by gender, socioeconomic status (SES), and race/ethnicity. In general, all things equal, boys tend to engage in a higher amount of risk behavior (e.g., antisocial, rebellious) than do girls (Goldstein et al., 2005; Rudasill et al., 2010) though a recent study found no systematic differences in rebellious behavior across gender in adolescence (Van Ryzin et al., 2012). The type of risk each gender tends to engage in also varies. For example, male adolescents have been found to drink more alcohol than smoke, whereas female adolescents have been found to more likely smoke cigarettes than drink alcohol, though males tend to engage in a higher amount of both (Gutman et al., 2011). Gender differences have also been found with regard to individual influence. For example, males have been found to have more

influence on peers than females on peers in risk behavior related to alcohol, marijuana, and tobacco use (Clark & Loheac, 2007). Racial/ethnic differences have been found in risk behavior. European Americans have been found to have higher levels and faster rates of increase in alcohol and cigarette use from early to late adolescence compared to African Americans (Gutman & Eccles, 2007; Gutman et al., 2011).

Research also suggests that the child-parent relationship may be more important for females than males in preventing engaging in risk behavior, and that males tend to favor independence more than females (Goldstein et al., 2005; Gutman et al., 2011; Miller et al., 2001). However, European American females and African American males may be at greater risk compared to European American males and African American females, respectively, when there is greater family conflict (Gutman et al., 2011). Consequently, degradation in the child-parent relationship (i.e., increased child-parent conflict) may disproportionately increase risk behavior in females compared to males, but also differ by race/ethnicity.

Previous Research

Conceptualization of risk behavior. Risk behavior has been conceptualized and assessed inconsistently in research studies (Gullone et al., 2000). For example, risk behavior has been investigated from a domain-specific perspective (e.g., health/safety risk behavior, financial risk behavior ethical risk behavior, recreational risk behavior, and social risk behavior) and, alternatively, from a domain-general perspective, simply risk behavior (Wang, Kruger, Wilke, 2009). Researchers that favor a domain-specific conceptualization of risk behavior argue that evolutionary traits (e.g., gender, age) underlie domain-specific risks (Hanoch, Johnson, & Wilke, 2006; Weber, Blais, & Betz,

2002). From an evolutionary perspective the life-history variable, age, likely explains individual differences in risk behavior because the stage of adolescence is a period of transition with many changes (e.g., expectations, physiology, responsibilities) for which adaptation is required for survival (e.g., academic, emotional, social, and behavioral success).

Researchers from a domain-general perspective of risk behavior base this orientation on the influence of a stable propensity to engage in risk behavior. This orientation is also supported by the tendency of adolescents who engage in one risk behavior to likely engage in several risk behaviors (Chassin, Presson, & Sherman, 1988; Gullone et al., 2000; Zuckerman & Kuhlman, 2000), and is supported empirically by significant intercorrelations among subscales and factor analysis of a general risk behavior scale (Caspi et al., 1997; Horvath & Zuckerman, 1993; Zuckerman & Kuhlman, 2000). Researchers from this orientation have represented risk behavior as a general latent factor (Ary et al., 1999) or general composite (Goldstein et al., 2005; Rudasill et al., 2010) that either predicts individual differences or represents an outcome variable.

Risk behavior should be studied as a domain-general construct. The investigation of risk behavior in the context of environmental relational influences has generally been studied using a specific index of risk (e.g., substance abuse, risky sexual activity, conduct problems, vandalism) rather than as a construct of risk common to a wide sample of risk behaviors. Studies that align with the domain-general risk construct and its developmental association with socialization variables are rare (Pardini et al., 2005), so a study that includes a construct of risk behavior that includes many indicators of risk. Constructs by their nature are not specific operational behaviors, are not observable, but

are rather indirectly observed through a sampling of a variety of behaviors (Meehl & Cronbach, 1955). Moreover, no singular risk behavior adequately captures the full meaning of the construct therefore a constellation of risk indicators increases construct validity (Evans, Li, & Whipple, 2013). In order to align with the domain-general literature based definition of risk behavior, many domains should be sampled, for example, substance use, delinquent behavior, vandalism, interpersonal aggression, or tobacco use. Lastly, there is additive value by including more information about the range of risk behaviors as the resulting construct has more predictive value (Dowdy, Furlong, & Sharkey, 2012).

Factorial invariance. I could not locate longitudinal studies involving explicit tests of factorial invariance of individual risk behavior or peer risk behavior across time. No information pertaining to cross-time factor heterogeneity and latent mean differences of risk behavior, and child-parent relationship quality and peer risk behavior were found. Differences in these measurement and latent properties would give a deeper understanding into the measurement of these constructs and the construct characteristics, uncontaminated by measurement error. For instance, investigation of a fairly homogenous sample across time with less factor variance (i.e., smaller distributional width) might suggest that adolescents are fairly situated around the typical score with few extremes, while analysis conducted with a more heterogeneous sample across time may result in a more complex pattern of variance over time (e.g., increasingly variable over time).

Longitudinal mediation. Some literature suggests that parents influence individual risk behavior via peers (Bogenschneider et al., 1998; Pardini et al., 2005; Van

Ryzin et al., 2012). However, it is still unclear whether the influence of child-parent relationship quality on individual risk behavior primarily operates indirectly through the individual's association with risky peers. In other words, whereas the direct effect of parental influence on risk behavior may weaken over time (or be inconsequential altogether), the indirect effect that parental influence has on individual risk behavior via peer influence may be stable or possibly decrease across time (though empirical findings support weak effects generally at later adolescent ages).

Causal system. Developmental questions formed within a hypothesized causal system may be answered in a latent cross-lagged longitudinal model. For instance, autoregressive effects modeled in panel models account for previous levels of a construct. The more similar the autoregressive coefficients are across time, the more the construct exhibits a consistent structure, which is a consistent developmental process across time (Little, 2013). Statistically equivalent autoregressive coefficients provide evidence of stability in the effect of previous levels on future levels. Similarly, reciprocal effects of family and peer influence can be tested for statistical equivalence to examine the relative magnitude of those effects, thereby directly testing Harris' (1995; 2009) theory that peer influence is much stronger than child-parent relational influence on risk behavior.

Purpose of the Study

The current study used the adolescent portion of the National Institute of Child Health and Human Development, Study of Early Child Care and Youth Development dataset to explicitly test sociological theories in the development of risk behavior.

The purpose of this study is to explicitly test the group socialization (Harris, 1995; 2009) and stage-environment fit theories (Eccles et al., 1993) that are important for

understanding dynamic relational influences during adolescence. Specifically, the purpose is to better understand the fluid relational contexts, child-parent relationship quality and peer risk behavior, and their influence on individual risk behavior and the influence of individual risk behavior on these relationships during adolescence.

In this study the latent variable, risk behavior, represented a general construct that accounts for the covariances among interrelated risk behaviors (i.e., reckless, rebellious, and antisocial). This study focused primarily on the social influence of parents and peers on adolescent risk behavior. Specifically, this study attempted to clarify how a parent's perception of the quality of the relationship with their child and how the frequency of risk behavior the child's peers demonstrate influence the child's own risk behavior. For example, does the quality of the child-parent relationship matter or do peer groups matter? If they both matter, does one matter more? Furthermore, does the strength of these relational influences change during early to middle adolescence? Last, does risk behavior itself influence these relationships from early to middle adolescence?

Chapter III: Method

This chapter focuses on descriptions of longitudinal data that were used for this study including the selection of participants and the measures used. Those descriptions are followed by an outline of the analytic approach used in the current study.

Longitudinal Sample

The National Institute on Child Health and Human Development Study of Early Child Care and Youth Development (NICHD SECCYD) was a comprehensive longitudinal study conducted in four phases that followed children from ages 1 month to 15 years. The purpose of the NICHD SECCYD study was to better understand variables among child care experiences, child care characteristics, and children's social, emotional, intellectual, and language developmental outcomes. This study began in 1991 as a cross-sequential design and was conducted in ten different locations: Little Rock, AR; Irvine, CA; Lawrence, KS; Boston, MA; Philadelphia, PA; Pittsburgh, PA; Charlottesville, VA; Morganton, NC; Seattle, WA; and Madison, WI. For more details regarding the study and site information refer to various manuscripts from the NICHD Early Childhood Care Research Network (ECCRN) or http://www.nichd.nih.gov/research/supported/seccyd.cfm.

Participants

To participate in the NICHD SECCYD study, the mother had to be at least 18 years of age, understand and speak English, and be of overall good health based on self-report. The first phase of the study, Phase I, began in 1991. Phase I consisted of study participants (N = 1364) from the time of birth through 3 years of age. Research assistants from respective sites visited with families of study participants to complete a home

interview when the child was 1 month of age. Phase II data were collected from 1995 to 1999 when the participants (*n* = 1,226) were in developmental stages from 54 months through 1st grade. The Phase III data collection period lasted from 2000 to 2004 with participants (*n* = 1,061) in 2nd through 6th grades. The final collection period, Phase IV, lasted from 2005 to 2007 and consisted of participants (n = 1,009) in 7th through 9th grades. The current study used data from the last two phases of the NICHD SECCYD, Phase III and Phase IV when participants were in 5th grade, 6th grade, and 9th grade. From Phase III, risk behavior data for individuals and peers at 5th grade (*n* = 994) and 6th grade (*n* = 1011) and child-parent relationship quality data at 5th grade (*n* = 1020; 994 mothers, 15 fathers, 7 grandparents, 2 other relatives, and 2 other adults) and 6th grade (*n* = 1024; 988 mothers, 25 fathers, 8 grandparents, 2 other relatives, and 1 other adult) were used for analyses. From Phase IV, risk behavior data for individuals at 9th grade (*n* = 957) and peers at 9th grade (*n* = 954) and child-parent relationship quality data at 9th grade (*n* = 975; 931 mothers, 27 fathers, 12 grandparents, 2 other relatives, 3 other adults) were used for analyses.

There was some attrition due to families dropping out of the study (e.g., no longer interested, moved away) or some families missing the data collection. The longitudinal sample consisted of 50.3% male and 49.7% female. The study participant race/ethnicity was as follows: 81.2% White, 12.2% Black, 1.4% Asian or Pacific Islander, .3% American Indian, Eskimo, or Aleutian, and 4.9% Other. The study participants could also select whether they identified as Hispanic (6.2%), independent of their previously selected race/ethnicity. Dummy variables were created for the race/ethnicity variable with two dummy variables to create three categories: White (81.2%), Black (12.2%), and

Other (6.6%). Another race/ethnicity variable was included for those who also identified as Hispanic.

Mother's education was used as a proxy for SES. Mother's education in the sample was as follows: 8.2% had not graduated high school or obtained a GED, 20.0% had graduated high school or obtained a GED, 33.1% had some college, 23% had a bachelor's degree from a college or university, 13.2% had some graduate work or a master's degree, .9% had a law degree, and 1.6% had more than a master's degree (M.D., Ph.D.). The SES variable was mean-centered at the average level of mother's education (14.4 years).

Measures

Risk behavior. The risk behavior self-report questionnaires were developed for use in the NICHD Study of Early Child Care and Youth Development, and they were based on work from Conger and Elder (1994), the Fast Track Project, and the New Hope Project. The questionnaire that assesses the individual study child's risk behavior is called *Things I Do* and the questionnaire that assesses the risk behavior in the study child's social network is called *Things My Friends Do*. The study child completed both of the questionnaires at 5th grade, 6th grade, and 9th grade. Parallel questionnaire items (19 items) were used across time (i.e., 5th, 6th, and 9th grades) and across group (i.e., individual and peer). The risk behavior questionnaires are included in the appendices based on granted permission from the NICHD SECCYD Agreement.

Individual risk behavior. The *Things I Do* questionnaire at 5th grade (see Appendix, Questionnaire 1) consists of 19 items assessing nineteen different risky behaviors (e.g., smoking, destroying property, skipping school, fighting, riding in a car

without a seatbelt). The *Things I Do* questionnaire asks the study child how many times he or she has ever engaged in risky behaviors with items based on a three-point scale (i.e., 0 = *Never*, 1 = *Once or twice*, and 2 = *More than twice*). The composite score reliabilities were reported in the form of Cronbach's alpha (α). The *Things I Do* risky behaviors measure resulted in a Cronbach's α = .68 based on a composite of scores from 19 items at 5th grade.

The *Things I Do* self-report questionnaire at 6th grade (see Appendix, Questionnaire 1) asks the study child how many times in the past year he or she has engaged in risky behaviors. The 6th grade *Things I Do* questionnaire is parallel to the 5th grade *Things I Do* questionnaire (i.e., asks the same 19 items). The 6th grade questionnaire scores exhibited a Cronbach's α = .74.

When the study child was in 9th grade, the *Things I Do* self-report questionnaire (see Appendix, Questionnaire 2) expanded to 61 items. For part of the *Things I Do* questionnaire, the study child is asked how many times in the past year he or she has engaged in 55 different risky behaviors (i.e., 0 = *Never*, 1 = *Once or twice*, and 2 = *More than twice*; items 56 through 60b. measure frequency of oral sex, sexual intercourse, and cigarette use–those were not used). The questionnaire at 9th grade includes the same 19 items as the questionnaires used at 5th grade and 6th grade (and scaled the same way), but includes new items on tobacco use, adolescent safety, and violence-related behaviors. Only the identical risk behavior items (parallel versions) were used to ensure the same configuration of items across time and to ensure proper comparisons of manifest indicator means and latent means. The 9th grade questionnaire scores for the 19 items exhibited a Cronbach's α = .82, indicating a higher internal consistency in scores than the scores

from 5th grade and 6th grade. Table 2 contains descriptive information of each item across time.

Peer risk behavior. The *Things My Friends Do* questionnaire asks the study child how many of his or her friends engage in a number of different risky behaviors with items based on a three-point scale (e.g., 0 = *None of them*, 1 = *A few of them*, and 2 = *Almost all of them*). The *Things My Friends Do* questionnaire at 5th grade and 6th grade is parallel (same 19 items) to the *Things I Do* self-report questionnaire at 5th grade and 6th grade (see Appendix, Questionnaire 1). The 5th grade and 6th grade *Things My Friends Do* questionnaires ask the study child how many of the kids he or she plays or hangs out with have ever engaged in risky behaviors. The *Things My Friends Do* questionnaire scores resulted in a Cronbach's $\alpha = .81$ and .85 at 5th grade and 6th grade, respectively.

The *Things My Friends Do* questionnaire at 9th grade consisted of 27 items (see Appendix, Questionnaire 3). The *Things My Friends Do* questionnaire at 9th grade asks the study child how many of the kids he or she plays or hangs out with have ever engaged in risky behaviors. The questionnaire at 9th grade includes the same items as the questionnaire used at 5th grade and 6th grade, but also includes eight new items (items 20–27), which deal with vaginal and oral sexual behavior, tobacco use, gang member affiliation, drug sales, and being arrested (items 26 and 27 measure sex-related experience outcomes rather than actual behavior). Only the identical risk behavior items used in 5th grade and 6th grade were used in 9th grade (parallel versions) to ensure the same configuration of items across time and to ensure proper comparisons of manifest indicator means and latent means. The 9th grade questionnaire scores exhibited a Cronbach's $\alpha = .91$, indicating a higher internal consistency in scores than the scores

from 5th grade and 6th grade. Table 3 contains descriptive information of each item across time.

Risk behavior validity. According to a study conducted by Rudasill and colleagues (2010), the *Things I Do* and the *Things My Friends Do* 6th grade risky behavior questionnaires were both used from the NICHD SECCYD dataset. Risky behavior was modeled as a single latent construct. The individual risky behavior variable was positively correlated with an anger/frustration variable (e.g., gets quite frustrated when prevented from doing something s/he wants to do; $r = .12$) and an activity level variable (seems to always be in a big hurry to get from one place to another; $r = .18$), suggesting they measured different constructs. Furthermore, a more recent study modeled risky behavior using the NICHD SECCYD dataset (Kamper & Ostrov, 2013) and found that a single risky behavior variable at age 15 positively correlated with relational aggression at 5th grade ($r = .18$) and physical aggression at 5th grade ($r = .16$).

In the Rudasill and colleagues study (2010), individual risky behavior was positively correlated with an inhibitory control (reflected) variable ($r = .20$), in which a higher score on an inhibitory control variable was associated with less inhibitory control. Thus, more impulsivity was associated with more risk, which indicates some similarity between impulsivity and risk (Zuckerman & Kulhman, 2000). Individual risky behavior was positively correlated with teacher-student conflict at 4th ($r = .24$), 5th ($r = .27$), and 6th ($r = .30$) grades, which was expected and indicated that more risk behavior was associated with more conflict and vice versa. Individual risk behavior was negatively correlated with teacher-student closeness at 4th ($r = -.14$), 5th ($r = -.16$), and 6th ($r = -17$)

grades, though not strongly correlated was expected and indicated that more risk was associated with less closeness and vice versa.

A longitudinal study using a different sample with different measures of risk indicated that measures of individual risk behavior and peer risk behavior were positively related yet distinct constructs from ages 12–17 years (*r*'s = .24 to .46), with increasingly strong relations over time (Van Ryzin et al., 2012). Furthermore, in that same study, measures of parenting and individual risk behavior (*r*'s = -.08 to -.30), and measures of parenting and peer risk behavior (*r*'s = -.20 to -.34), were inversely related from ages 12–17 years, suggesting they are distinct constructs.

Individual risky behavior was also positively and strongly correlated with friends' risky behavior ($r = .72$), which has been found in a previous study using the NICHD SECCYD data (see Campbell, Spieker, Burchinal, & Poe, 2006), in which an individual's total risk-taking score was positively correlated with friends' total risk-taking score at 5th grade ($r = .70$) and 6th grade ($r = .72$). These correlations show that the constructs are strongly correlated, yet distinct constructs. Last, in another recent but separate study, the *Things I Do* risky behavior scale at age 15 was used to form a single latent construct of delinquency (Meldrum, Young, Burt, & Piquero, 2013). The delinquency latent variable had a negative correlation with adolescent-reported self-control ($r = -.63$), indicating that self-control (impulsivity) is negatively related to risk taking (Zuckerman & Kuhlman, 2000).

In another study the risky behavior variable for friends was statistically significantly positively correlated with an anger/frustration variable ($r = .09$) and an activity level variable ($r = .17$), suggesting they are separate constructs. Friends' risky

behavior was positively correlated with an inhibitory control (reflected) variable (r = .19), in which a higher score on an inhibitory control variable was associated with less inhibitory control, suggesting different constructs. Friends' risky behavior was also positively correlated with teacher-student conflict at 4th (r = .18), 5th (r = .25), and 6th (r = .22) grades, whereas it was negatively correlated with teacher-student closeness at 4th (r = -.10), 5th (r = -.14), and 6th (r = -12) grades. These correlations were in the expected direction based on previous research and indicated that though these constructs were related they were distinct.

Child-parent relationship quality. The Child-Parent Relationship Scale that was used in the NICHD SECCYD studies used parallel items from the Student-Teacher Relationship Scale-Short Form (STRS-Short Form; Pianta, 1992). The STRS Short-Form excludes the Dependency Subscale of the full 28-item STRS Scale. The items are based on a five-point Likert scaling (e.g., Item responses range from 1 = "Definitely does not apply" to 5 = "Definitely applies"). When the study child was in 5th grade, 6th grade, and 9th grades, the mother, the primary assessor, or alternate primary caregiver (e.g., father, grandparent, other relative, other adult) completed the Child-Parent Relationship Scale to assess their perceptions about their relationship with the study child. The Child-Parent Relationship Scale forms a Conflict with Child composite (i.e., 7 items) and a Closeness with Child composite (i.e., 8 items), which both form an overall Total Positive Relationship with Child composite (i.e., 15 items) that represents child-parent relationship quality.

The Conflict items were reverse coded so that relationship quality ranged from a continuum in which a low score indicated high conflict and a high score indicated low

conflict. Therefore, higher scores on the Conflict with Child, the Closeness with Child, and the Total Positive Relationship with Child composites indicate, less conflict, more closeness, or a more total positive relationship, respectively, between the rater and the study child. When the study child was in fifth grade the score reliabilities were high for Conflict with Child (α = .84), Closeness with Child (α = .73), and Total Positive Relationship with Child (α = .82). When the study child was in sixth grade the score reliabilities were high for Conflict with Child (α = .86), Closeness with Child (α = .76), and Total Positive Relationship with Child (α = .85). When the study child was in ninth grade the score reliabilities were high for Conflict with Child (α = .87), Closeness with Child (α = .79), and Total Positive Relationship with Child (α = .85). Table 4 contains descriptive information of each item across time.

Child-parent relationship quality validity. The Child-Parent Relationship Quality Scale is based on the Student-Teacher Relationship Quality Scale, which suggests that Conflict and Closeness items load on separate but correlated latent factors (Koomen, Verschueren, van Schooten, Jak, & Pianta, 2012; Webb & Neuharth-Pritchett, 2011). A study using the child-parent relationship quality measure to create a total positive relationship scale at Grade 3 found positive correlations with a measure of social skills at third grade (r = .21) and with a student-peer relationship variable, social support, at third grade (r = .12). The child-parent relationship quality measure had negative correlations with student-peer relationship variables, overt aggression towards peers (r = -.11), and relational aggression towards peers at third grade (r = -.16; Perdue, Manzeske, & Estell, 2009). This indicates that though these variables are positively and negatively related, respectively, which was expected, these are distinct constructs.

In a different study using the Child-Parent Relationship Quality Scale, positive correlations between mother-child relationships and teacher-child relationships (r = .11), and child's social competence (r = .34) were found in a Chinese sample (Zhang, 2011). These were expected findings but indicated separate constructs. For example, it was expected that a better child-parent relationship is associated with a child's better social competence, as social skills are practiced within the child-parent relationship. In a longitudinal study using the Child-Parent Relationship Quality Scale across three time points (i.e., age 4.5 years, third grade, and fifth grade), the Child-Parent Relationship Quality Scale had positive correlations with self-control across time (r = .21 to .39), but negative correlations with deviance across time (r = -.14 to -.24; Vazsonyi & Huang, 2010). These correlations were expected since a better child-parent relationship is associated with better self-control and decision-making, which helps prevent association with deviant peers. Furthermore, the findings demonstrated that these were different constructs. Last, in a longitudinal study using two different measures of parenting (i.e., parental monitoring and family relationship quality), the measures were positively related (r's = .41 to .53) from ages 12–17 years, indicating they were moderately related but separate constructs (Van Ryzin et al., 2012).

Missing Data

Longitudinal studies are prone to missing data issues because there is increased vulnerability to study participants dropping out of a study for various reasons (e.g., moving; Little, 2013).

Missing data methods have evolved from "old traditional" approaches to "new and modern" approaches (Graham, 2009). One of the most commonly used yet most

obsolete approaches to handling missing data is excluding cases with missing data (Baraldi & Enders, 2010; Enders, 2010). For example, listwise deletion completely discards cases with missing values; therefore, only cases that have complete data are analyzed. In a similar method, pairwise deletion involves removing incomplete cases on an analysis-by-analysis basis such that only cases relating to each pair of variables with missing data involved are deleted. Pairwise deletion is an incremental improvement since you can use more of the data, but each set of statistics may be based on a different subset of cases. The problem with these deletion methods is that only partial data is used, thereby increasing Type II error rates by reducing total sample size. Moreover, unless the missing data are assumed to be missing completely at random (MCAR; i.e., not due to any of the study variables) then these approaches will result in biased estimates of the true population values.

Other traditional missing data methods include single imputation methods such as mean imputation, regression imputation, and stochastic regression imputation (Baraldi & Enders, 2010; Graham, 2009). Mean imputation consists of replacing missing values with the mean of a particular variable for the available data. This is problematic as replacing missing scores with a constant value (i.e., the mean) will result in lower variance and an inflated sense of precision, typically resulting in higher Type I errors. Regression imputation replaces missing values with predicted scores from a linear regression based on other observed variables. This too is problematic because the regression imputation does not model the variability in the data due to the missingness, essentially treating the single predicted value as the exact true value that would have been present without the missingness. Therefore, as with mean imputation but to a lesser extent, there is an

inflation of precision. A further improvement over these methods is the stochastic regression imputation in which a normally distributed error term is added to each predicted score from the regression imputation, accounting for some of the variability incurred by the missingness. While this seems promising at first glance, it still fails to solve the problem of having a single, exact value in place of the missingness, which creates inappropriately small standard errors and increased Type I error rates (Baraldi & Enders, 2010).

New and modern approaches have become increasingly popular to handling missing data (Little, 2013). Three popular and innovative approaches to handling missing data include the expectation-maximization (EM) algorithm, multiple imputation (MI), and maximum likelihood (ML) estimation methods (Graham, 2009). The EM algorithm essentially produces an ML variance-covariance matrix with a vector of means but this method is not particularly well suited for theoretical research involving hypothesis testing (Baraldi & Enders, 2010). However, MI and ML estimation are considered the best modern methods for handling missing data for theoretical research (Little, 2013; Graham & Schafer, 2002). The primary benefit of both MI and ML estimation techniques is that they do not discard any of the data but rather use it to inform the missing data, and they are both generally appropriate and less biased missing data methods under certain assumptions. The MI method, a data-based approach, involves the use of regression imputation and Bayesian estimation in order to produce several different imputed data sets (the number of which is decided *a priori*). These imputed data sets each contain different estimates of the missing values, which are then analyzed separately. The model results are then aggregated into a single set and interpreted as normal.

The model-based approach to handling missing data is referred to as maximum likelihood (ML). With ML, the parameters of a statistical model are estimated in the presence of missing data by producing a different likelihood function for each different missing data pattern. These different likelihoods are then aggregated to compute the overall likelihood for a given set of model parameters, and a maximum likelihood is determined by which set of model parameters produces the largest overall likelihood of producing the sample data (Little, 2013). For the purposes of this investigation, the ML estimation technique will be used because the ML procedure is well suited for longitudinal SEM models (Baraldi & Enders, 2010; Little, 2013) and it tends to be a more powerful technique than MI (Graham, Olchowski, & Gilreath, 2007).

Missing data mechanisms are assumptions used to describe patterns of missing data and they play a substantial role in determining how well missing data methods are able to account for the missingness (Little, 2013; Little & Rubin, 2002; Rubin, 1976). There are three missing data mechanisms used to describe missing data patterns that vary on a continuum of how strict the assumption is in regards to the missing data. The strictest assumption is missing completely at random (MCAR). When missing data are MCAR, missingness is unrelated to any variables of interest. For example, if a study subject misses a survey that is unrelated to health because he/she was sick, the missingness is completely random and cannot be predicted by any variables related to the study. The next most restrictive missing data assumption is missing at random (MAR), which means that there is systematic missingness in the data set, but once conditioned on variables in the study, the missingness is completely random (i.e., the missingness can be accounted for by other observed variables). For example, if a study subject's academic

performance is being investigated and school absence is related to academic performance (e.g., missing homework assignments are related to school absence), including school absences would account for the cause of the missingness and allow for the missing data method to produce unbiased results. Therefore, in order for the MAR assumption to be met, the absence variable must be included in the analysis. The least strict assumption is missing not at random (MNAR). With MNAR, the missingness is dependent on the values of the incomplete data or on unobserved variables. Using the previous example, excluding the absence variable would bias the resulting estimate. There are no formal tests for MAR or MNAR missingness assumptions, but one can test for MCAR missingness using Little's MCAR test in SPSS. If the MCAR test is statistically significant, it means that the missing data patterns are not completely at random and could therefore be either MAR or MNAR. Longitudinal studies are most likely to be missing data due to attrition (e.g., moving away) or non-responders and they are therefore likely to satisfy the MAR assumption (Little, 2013). Using ML and the assumption that the missingness mechanism is at least MAR, the sample results will be less biased estimates of the true population parameters when including auxiliary variables, which was done in this study.

Analytic Plan

Measurement models. SEM entails the construction of measurement models, which specify the relationships among latent and manifest variables (e.g., risk items, child-parent relationship quality items). Confirmatory factor analysis structural equation models (CFA-SEM) were created in M*plus* 7.0 (Muthen & Muthen, 2012) based on the items from the scales at each time point. The same configuration of items was used across

time for each construct. Items that are similar in risk behavior and theoretically linked, for example antisocial behavior, were grouped together and tested for unidimensionality using CFA-SEM. Model fit and factor loadings were examined for unidimensionality. This step was repeated for the reckless and rebellious behaviors. The same procedure was also used for the child-parent relationship quality latent variable (closeness and conflict). For example, all closeness items formed a single latent factor and were tested for unidimensionality (same was done for all conflict items) by examining model fit and factor loadings. If unidimensionality were an acceptable assumption, facet-representative parcels were formed (e.g., reckless, rebellious, antisocial, closeness, and conflict) by averaging the respective items together from these unidimensional factors.

Parceling is an aggregation technique that combines several scale items into a single parcel by averaging the items (Little, Rhemtulla, Gibson, & Schoemann, 2013). Specifically, facet-representative parceling removes the variance specific to each facet out of the main construct, which means that only the variance shared among the parcels (which, in this case, would only be general risk behavior, rather than specifically recklessness, rebellious, or antisocial risk behavior or only child-parent relationship quality, rather than specifically closeness and conflict) makes its way into the latent construct and therefore the model and interpretations. This provides a more pure look at the latent construct, removed from the more fractured facets. Because facet-representative parcels were used in this study, unidimensionality was not explicitly required. This is because secondary factors within a parcel are residualized into the specific error variance, not the common latent variance (see Little et al., 2013).

Parcels are often favored over individual scale items. Parcels (relative to individual items) are more reliable, less likely to violate distributional assumptions, have greater communality (i.e., proportion of variation in a given variable explained by the common factors), and have a higher ratio of common to unique factor variance (Little, Cunningham, Shahar, & Widaman, 2002), all of which are beneficial characteristics when the purpose of the study is on substantive relations among the factors.

At each time point three latent constructs were estimated with the same configuration of parcels used at each time point used across time (see Figure 4). One measurement model will be created for the three constructs across the three time points (i.e., 5th grade, 6th grade, 9th grade). The measurement model included nine latent constructs: individual risk behavior as measured by the *Things I Do* Scale at Time 1 (Individual Risk Behavior-Grade 5), Time 2 (Individual Risk Behavior-Grade 6), and Time 3 (Individual Risk Behavior-Grade 9); peer risk behavior as measured by the *Things My Friends Do* Scale at Time 1 (Peer Risk Behavior-Grade 5), Time 2 (Peer Risk Behavior-Grade 6), and Time 3 (Peer Risk Behavior-Grade 9); and child-parent relationship quality as measured by the *Child-Parent Relationship Quality* Scale at Time 1 (Child-Parent Relationship Quality-Grade 5), Time 2 (Child-Parent Relationship Quality-Grade 6), and Time 3 (Child-Parent Relationship Quality-Grade 9).

Longitudinal factorial invariance. Longitudinal factorial invariance tests the assumption that the same constructs across time are fundamentally the same. When observed cross-time construct differences exist yet the constructs are factorially invariant, those differences are likely due to differences in age, maturation, or experience, not to fundamental measurement differences (Little, 2013). For instance, when context

influences affect the construct (factor variance) but not the item-specific information (manifest indicator variance) then factorial invariance will be tenable. Factorial invariance requires that increasingly restrictive constraints be placed on model parameters and tested in sequence (Keith & Reynolds, 2012; Meredith, 1993). When covariance and mean structures are modeled, the sequence of steps can vary though certain levels of invariance require previous establishment of invariance at other levels (e.g., weak factorial invariance before strong factorial invariance).

In testing measurement invariance, the measurement model parameters are of interest. The first step is configural invariance, which tests whether the same pattern of free loadings on latent factors is the same across time, supporting a consistent general factor structure. The second step in measurement invariance is called factor loading invariance (sometimes referred to as weak factorial invariance) and this tests whether corresponding factor loadings are proportionally the same across time when the factor variances are allowed to vary across time. This tests whether the same one-unit increase in latent individual risk taking results in a certain unit increase on a specific risk item consistently across time, for example. The third step called manifest intercept invariance (also known as strong factorial invariance) involves mean structures and must be established prior to tests of latent factor mean differences across time. Manifest intercept invariance requires factor loading invariance. In tests of manifest intercept invariance, latent factor means are allowed to vary while corresponding manifest intercepts are constrained. If manifest intercept invariance is tenable then mean differences across time are the result of latent factor means, not changes in the items across time. Manifest intercept invariance indicates that the items have the same baseline across time at a given

level of the latent variable. The last step in establishing measurement invariance, strict factorial invariance, in which the corresponding residual variances (i.e., information not explained by the latent variables) are constrained to be equivalent across time, was not tested. Strict factorial invariance is not necessary for establishing factorial invariance, and is not recommended due to the corresponding residual variances being correlated across time (Little, 2013).

In contrast to measurement invariance, structural invariance involves testing specifically the latent parameters for equivalence. Establishing factorial invariance prior to structural invariance ensures consistent measurement of the latent factors, and thus unambiguous testing of construct characteristics. When testing for the equivalence of factor variances, for example, factor loading invariance must first be established. Factor variance invariance tests whether the constructs are equally homogeneous/heterogeneous across time (Keith & Reynolds, 2012; Little, 1997) by testing whether there is larger or smaller variance in the latent factor at different time points. Last, when testing factor means, which determines if the average of the construct is constant across time, manifest intercept invariance must first be established to ensure equivalent indicator-factor structure of the latent mean.

A total of five invariance tests were completed: three for assessing the degree of measurement invariance (i.e., configural, weak, strong), and two for assessing the degree of structural invariance (i.e., factor variances, factor means) across time. If cross-time factor variances differed, then they were freed and a ratio of the factor variances were calculated. If cross-time factor means differed, then they were freed and a standardized effect size of the latent mean difference was calculated as a latent Cohen's *d*.

Cross-lagged panel model. CFA-SEM models were then used to examine the relationships among the individual risk behavior, peer risk behavior, and child-parent relationship quality constructs (Kline, 2011). The procedure for building a cross-lagged panel model was based on Little and colleagues' (2007) stepwise methodology.

First, autoregressive paths were added into the model such that individual risk behavior at Time 3 was regressed onto individual risk behavior at Time 2, and individual risk behavior at Time 2 was regressed onto individual risk behavior at Time 1, for example. The same procedure was followed for each construct. Next, within-time correlations among the residuals of the constructs (except Time 1 which are latent correlations) were added to account for simultaneous relationships between constructs, while cross-lagged (reciprocal) paths were included into the panel model to account for delayed relationships between constructs across time.

Chi-square difference tests ($\Delta\chi^2$) were used to test whether the autoregressive paths and cross-lagged regression paths were statistically equivalent. These are explicit tests of change related to stability and stationarity (Little, 2013). One aspect of change known as stability refers to the unchanging level of a variable over time. For instance, if the autoregressive path of a construct is strong and relatively consistent with itself over time, it is said to have stability. A second aspect of change known as stationarity refers to an unchanging causal structure. That is, if the corresponding autoregressive paths and the reciprocal paths have equivalent magnitudes across time, then the system is said to have stationarity. However, for testing mediation (i.e., an intervening variable that exists between a predictor variable and an outcome variable), stability and stationarity are not

essential and is rarely met in a developmental system (Cole & Maxwell, 2003; Little, 2013).

Mediation model. The use of mediation models is important for understanding an effect on an outcome in developmental research. Mediation models are useful for describing how a presumed cause (X) may have an effect on an outcome (Y), through another variable (Selig & Preacher, 2009). A mediator is also described as an intervening variable between a cause and an effect (Keith, 2006). If the model is correct, when the magnitude of the direct effect on an outcome is lower relative to the magnitude of the direct effect on an outcome with the inclusion of an intervening variable, then partial mediation is said to occur. If the magnitude of the direct effect of a presumed cause on an outcome is effectively lowered to zero with the inclusion of an intervening variable, then full mediation is said to occur (Keith, 2006).

Longitudinal structural equation models are particularly useful for testing mediation as they overcome some of the drawbacks related to cross-sectional data (Cole & Maxwell, 2003; Maxwell & Cole, 2007). For instance, the causal relationships specified in a mediation model take time to unfold and therefore cannot be assumed to occur instantaneously. When using longitudinal data, unlike cross-sectional data, the previous levels of the variable of interest can be taken into account. Cross-sectional data presumes the magnitude of effect is independent of the time lag. In this research the first lag was a year apart (5th grade to 6th grade) and the second lag was three years apart (6th grade to 9th grade). Phantom variables were used at 7th and 8th grades, which allowed continuous time modeling despite missing data and allowed equal intervals of

measurement (Oud & Voelkle, 2014). Therefore, in this study each lag was one year apart.

Cross-lagged panel modeling as a structural model for testing mediation produces two types of indirect effects (Gollob & Reichardt, 1991). The first type of indirect effect, called a time-specific indirect effect, is the single path of influence from the predictor, through the mediator(s), to the outcome variable (Selig & Preacher, 2009). The time-specific indirect effect represents the paths by which the predictor variable can indirectly influence the outcome variable, although this indirect effect is specific to the observed interval (ages or developmental stages). The second type is referred to as total indirect effects. The total indirect effect is simply the sum of the time-specific indirect effects. In testing mediation within cross-lagged panel models, differential mediation may occur where some indirect effects are statistically significant and meaningful whereas other paths of indirect effects are not.

The sequence of steps in the process for testing full longitudinal mediation may vary; however, there are certain important steps that must be met in order to proceed (Cole & Maxwell, 2003; Little, 2013). An important and essential first step is establishing measurement invariance. Next is the estimation of mediational effects. In this step, the overall direct, indirect, and total effects are estimated followed by tests of statistical significance. For instance, in order for mediation to exist, the total indirect effect should be statistically significant and can be tested using bootstrapping (where the *SE* is estimated) in M*plus*. This method tests mediation by assessing whether the product of the indirect pathways is statistically significantly different from zero. Full longitudinal mediation can be tested despite having non-significant regression pathways in the cross-

lagged panel model, as the mediation pathway can have a substantially different error structure than its constituent pathways (Preacher & Hayes, 2004). The multiplicative product of the indirect effects may be statistically significant; therefore, mediation can exist without having individual pathways be statistically significant.

Demographic influences. Previous research has found that risk behavior varies by gender, SES, and race/ethnicity (e.g., Goldstein et al., 2005; Gutman & Eccles, 2007; Gutman et al., 2011; Miller et al., 2001; Rudasill et al., 2010). Therefore it is important to include gender, SES, and race/ethnicity as background variables to help increase the validity of the model estimates.

Model Evaluation

An independence (null) model (i.e., worst fitting model) was first constructed and estimated to provide a baseline model for accurate computation of the relative fit indices, the Comparative Fit Index (CFI) and the Tucker-Lewis Index (TLI; Widaman & Thompson, 2003). A null model is one in which neither the variances nor the means of corresponding indicators change over time for each group.

Standalone fit indexes that were used in this study included the CFI (Bentler, 1990), which is the ratio of misfit of the reproduced model to the null model. The TLI was also used, which is the ratio of misfit of the reproduced model to the null model while adjusting for *df* (which emphasizes parsimony over complexity). Additionally, the Root Mean Square Error of Approximation (RMSEA; Steiger & Lind, 1980), which provides an index of the amount of misfit per degree of freedom in the model compared to a saturated model (best fitting model), was used to investigate absolute fit. Guidelines for global model fit are CFI and TLI values above .95, which suggests acceptable model

fit and RMSEA values below .05 suggests close fit (Schermelleh-Engel, Moosbrugger, & Muller, 2003). The chi-square fit statistic (χ^2) was also used to examine model fit.

When testing the factorial invariance models (i.e., configural, weak, and strong), the change in the CFI (ΔCFI; with ΔCFI $\leq$ .01 considered inconsequential) was used because the ΔCFI is less sensitive than chi-square difference test ($\Delta\chi^2$) to trivial differences in the model parameters that have no substantive bearing on invariance (Brown, 2006; Cheung & Rensvold, 2002). The χ^2 statistic was used for testing equivalence of the structural elements (i.e., latent means, variances, and regressions), since fewer parameters are constrained at once and more precision is required at the latent level, given that latent variables do not possess measurement error (Brown, 2006). The $\Delta\chi^2$ was primarily used to investigate nested alternative models with a statistical significance level of $p < .05$. The chi-square difference testing was completed using the Satorra-Bentler scaled chi-square (S-B $\Delta\chi^2$) to provide a correction for non-normality (Satorra & Bentler, 2001). For non-nested models, a comparison of the Akaike Information Index (AIC, Akaike, 1987) and the Bayes Information Index (BIC, Schwartz, 1978) was used, with smaller values indicating better model fit.

The weighted least squares–mean and variance corrected estimator was used when testing unidimensionality of the categorical risk behavior scale items and the child-parent relationship quality scale items. A maximum likelihood estimator with robust standard errors (MLR; Yuan & Bentler, 2000) was used for subsequent model testing with the parcels as continuous indicators. The MLR estimator provides the same parameter estimates as ML, but provides both the model χ^2 and the standard errors of the parameter estimates with a correction for non-normality (Brown, 2006). The findings

may differ based on which estimator is used. The weighted least squares–mean and variance corrected estimator is not robust to non-normal continuous variables, uses a probit function instead of a logistic function, and handles missing data differently from MLR estimation.

Chapter IV: Results

Missing Data

An analysis of missing data in the longitudinal sample was conducted as a pre-modeling procedure to determine if missing data were likely to bias parameter estimates. For the overall total longitudinal sample, approximately 6.2% of data were missing. Little's test of Missing Completely at Random (MCAR) for the total longitudinal sample was statistically significant, χ^2 (22346) = 25629.454, $p < .001$, indicating that missing data were unlikely due to be missing completely at random (MCAR). For the entire sample, 724 cases (69% of the sample) were not missing any information on any item at any time point (i.e., for grades 5, 6, and 9). The missing data patterns revealed that the majority of cases with missing data had data missing at one time point but had data at the other two time points (e.g., missing data at 5th grade but not missing data at 6th and 9th grades). A closer examination of all the items used in this study indicated that all items had less than 5% of data missing. Though whether missingness was only due to Missing at Random (MAR) processes could not be explicitly tested, less than 5% of data were missing on any variable, therefore, missing data were unlikely to bias parameter estimates (Graham, 2009). Regardless of whether data were missing, all cases (incomplete or not) were analyzed using full-information maximum likelihood estimation with the inclusion of auxiliary variables (e.g., gender, race/ethnicity, SES) to inform the parameters' values and standard errors to help provide less biased parameter estimates, which is appropriate given the MAR assumption. Therefore, as is always the case with longitudinal samples, some data were missing, but the missing data were likely inconsequential in biasing parameter estimates (Graham, 2009; Little, 2013).

Item Level Descriptive Statistics

Means, standard deviations, skewness, and kurtosis values are provided for individual risk behavior (Table 2), peer risk behavior (Table 3), and child-parent relationship quality (Table 4) for all items used in 5th, 6th, and 9th grades. There were four different individual risk behavior items, one at 5th grade ("Purposely set fire in a building or in any other place"), and two at 5th and 6th grades ("Used or smoked marijuana," "Taken or stolen something not theirs worth a lot, like a video game") that had minimal variance. Even though they provided little or no information about individual differences in those behaviors within the time period, because means were analyzed, it was important to include these variables in the analysis across time (later they were parceled), so it did not bias the growth estimates (in the means). The "broke into building" item was excluded all together because it provided minimal information at all time points (i.e., there was relatively infrequent endorsement of this item in 5th, 6th, and 9th grades). Most individual risk behavior item means increased over time (except one rebellious item, "run away" and four antisocial items, "carry," "fist," "animal," and "broke" items, which all decreased). All peer risk behavior item means increased over time. Most child-parent relationship quality item means for closeness and conflict (reverse coded) decreased over time, indicating less closeness and more conflict. All closeness item means decreased over time. Most conflict item means decreased (except the "struggle" item which increased), which indicated higher conflict.

Univariate skewness and kurtosis values of 2 and 7, respectively, are generally considered acceptable when using maximum likelihood estimation procedures (Brown, 2006; West, Finch, & Curran, 1995). The items for individual risk behavior had

univariate skewness (-0.56 to 31.80) and kurtosis (-1.58 to 1011.00) values that indicated substantial non-normality (see Table 2). The items for peer risk behavior had univariate skewness (-1.01 to 16.63) and kurtosis (-1.05 to 306.56) values that indicated substantial non-normality (see Table 3). The items for child-parent relationship quality had univariate skewness (-3.45 to 0.01) and kurtosis (-1.45 to 15.22) values that indicated non-normality (see Table 4). Because these items demonstrated a large degree of non-normality (West et al., 1995), these items were first tested for dimensionality and then transformed into more normally distributed, continuous indicators of their respective constructs (Little et al., 2013).

Measurement Models

Unidimensionality testing. Categorical confirmatory factor analysis was used to test unidimensionality of the different facets of risk behavior (i.e., reckless, rebellious, and antisocial) and child-parent relationship quality (i.e., closeness, and conflict). Unidimensionality of each facet of risk behavior and child-parent relationship quality was tested at each time point (5th, 6th, and 9th grade). The weighted least squares–mean and variance corrected estimator was used for these analyses. Items that were theoretically linked based on previous research were grouped together in this study and tested for unidimensionality. The set of items (varied from 3–8 items) were regressed onto a single latent factor and the model fit and the standardized factor loadings were examined as indicators of a unidimensional factor structure. For individual and peer risk behavior, three single factor models were each run separately to test the dimensionality of reckless behavior, rebellious behavior, and antisocial behavior. Even if unidimensionality wasn't fully supported, which is not assumed when using facet-representative parceling (see

Little et al., 2002; Little et al., 2013), a parcel was created for that construct to be used in later analysis. Parcels were created, as indicators of respective constructs, by averaging items into three different parcels for risk behavior and two different parcels for child-parent relationship quality. If the items within the parcel shared a secondary factor (i.e., correlated residual, dual loading), the parcel served to isolate this uniqueness into the residual error variance (Hall, Snell, & Foust, 1999; Little et al., 2013).

Individual risk behavior. For individual risk, three different models (reckless, rebellious, and antisocial) were tested for unidimensionality.

Reckless behavior. Unidimensionality of the three items related to reckless behavior was tested in 5th grade. When these items were regressed onto a single latent factor, global model fit was perfect because the model is perfectly identified (i.e., nine parameters were estimated and nine pieces of information were provided). The standardized factor loadings indicated they all loaded adequately (.56 to .87) on a single latent factor (see Table 5, Reckless). Reckless behavior at 6th grade was tested using the same three items. When these items were regressed onto a single latent factor, the estimates indicated high standardized factor loadings (.73 to .85). Reckless behavior at 9th grade had similar standardized factor loadings (.68 to .77).

In general, across all grades "wearing a seatbelt" had the highest standardized factor loadings, whereas "doing something daring" had the lowest standardized factor loadings. Overall, although model fit could not be used to test unidimensionality due to a just-identified model, the items had strong loadings on the factor and were conceptually consistent with the construct and used in previous research to represent a reckless behavior factor (Gullone et al., 2000).

Rebellious behavior. Unidimensionality of the eight items related to rebellious behavior was tested in 5th grade. When these eight items were regressed onto a single latent factor, the model would not converge due to the marijuana item. Only one study participant out of the total sample reported using marijuana in 5th grade. This item did not covary with other items; therefore, there was no model convergence when this item was in the model. The item was removed and the new model was estimated. Model fit was poor according to the relative fit indexes, but acceptable according to the absolute fit index, [χ^2 (14) = 121.208, p < .001, CFI = .704, TLI = .556, RMSEA = .090]. The item, "steals something worth a lot" had minimal covariance with other items (i.e., 1% or less of people who reported "stealing something worth a lot" engaged in the other behaviors). The "steals something worth a lot" item was removed and the new model was estimated. Model fit was acceptable for these six items, [χ^2 (9) = 15.580, p = .076, CFI = .936, TLI = .896, RMSEA = .027], with adequate standardized factor loadings (.39 to .73; see Table 5, Rebellious). Even though these two items ("marijuana" and "steals something worth a lot") were excluded from the categorical factor analysis (due to minimal covariance), they were still included in the facet-representative parcels to provide mean and variance information (i.e., there was more variance for these items at later time points).

Unidimensionality of the same eight items related to rebellious behavior was tested in 6th grade. When these eight items were regressed onto a single latent factor, the model converged but with substantial issues with the residual covariance matrix (i.e., unable to estimate the residuals correctly). Including the "marijuana" item resulted in non-positive definite solutions. Therefore it was excluded. This model resulted in excellent fit, [χ^2 (14) = 19.707, p = .14, CFI = .989, TLI = .983, RMSEA = .020] with

adequate standardized factor loadings (.52 to .98; see Table 5, Rebellious). Even though the item corresponding to marijuana use was excluded from the categorical factor analysis, it was still included in the facet-representative parcels to provide mean and variance information.

Unidimensionality of the same eight items related to rebellious behavior was tested in 9th grade. When these eight items were regressed onto a single latent factor, the model terminated normally with no errors. All items were included. Model fit was acceptable, [χ^2 (20) = 109.593, $p < .001$, CFI = .970, TLI = .959, RMSEA = .070], with adequate standardized factor loadings (.50 to .89; see Table 5, Rebellious).

For the most part, across all grades "substance use" had the highest standardized factor loadings, whereas "running away" had the lowest standardized factor loadings. Overall, the items corresponding to rebellious behavior were mostly supportive of a unidimensional factor structure at each time point. Some of these items were rare or infrequent and therefore made testing the dimensional factor structure difficult. However, when these items were all endorsed sufficiently (i.e., in 9th grade), the items corresponding to rebellious behavior indicated a unidimensional factor structure.

Antisocial behavior. Unidimensionality of the eight items related to antisocial behavior was tested in 5th grade. When these eight items were regressed onto a single latent factor, the model would not converge due to the "broke into building" item. This item had no variance, no study participant endorsed the item. This item was removed and the categorical factor analysis was rerun with the remaining seven items. Model fit was poor according to the relative fit indexes but acceptable according to the absolute fit index, [χ^2 (14) = 108.318, $p < .001$, CFI = .771, TLI = .657, RMSEA = .084]. The "set

something on fire" item was removed because only three people endorsed it and this item had low covariance with other items. The model was rerun with the remaining six items. Model fit was excellent, [χ^2 (9) = 14.73, p = .10, CFI = .981, TLI = .968, RMSEA = .026], with adequate standardized factor loadings (.44 to .81; see Table 5, Antisocial). The item corresponding to "setting something on fire" was excluded from the categorical factor analysis (due to minimal variance), but it was still included in the facet-representative parcels to provide mean and variance information (i.e., there was more variance for this item at later time points).

Unidimensionality of the same eight items related to antisocial behavior was tested in 6th grade. When these eight items were regressed onto a single latent factor, the model would not converge due to the "broke into building" item. This item had minimal variance, only one study participant endorsed the item. This item was removed and the categorical factor analysis was rerun with the remaining seven items. Model fit was excellent, [χ^2 (14) = 28.534, p < .012, CFI = .979, TLI = .969, RMSEA = .033], with adequate standardized factor loadings (.60 to .83; see Table 5, Antisocial).

Unidimensionality of the same eight items related to antisocial behavior was tested in 9th grade. When these eight items were regressed onto a single latent factor, there were model convergence problems due to the "broke into building" item. This item had little variance, with only eight participants endorsing this item. This item was removed and the categorical factor analysis was rerun with the remaining seven items. Model fit was excellent, [χ^2 (14) = 23.187, p = .06, CFI = .985, TLI = .977, RMSEA = .027], with adequate standardized factor loadings (.49 to .85; see Table 5, Antisocial).

For the most part, across all grades "threat" had the highest standardized factor loadings, whereas "hurting an animal" had the lowest standardized factor loadings. Overall, the items corresponding to antisocial behavior were mostly supportive of a unidimensional factor structure at each time point. Some of these items were rare or infrequent and therefore made testing the dimensional factor structure difficult. However, when these items were endorsed sufficiently, the items corresponding to antisocial behavior indicated a unidimensional factor structure.

Peer risk behavior. For peer risk, three different models (reckless, rebellious, and antisocial) were tested for unidimensionality.

Reckless behavior. Unidimensionality of the three items related to reckless behavior was tested in 5th grade. When these items were regressed onto a single latent factor, global model fit was perfect, because the model is perfectly identified (i.e., nine parameters were estimated and nine pieces of information were provided). The standardized factor loadings indicated they all loaded adequately (.60 to .81) on a single latent factor (see Table 6, Reckless). Reckless behavior at 6th grade was tested using the same three items. When these items were regressed onto a single latent factor, the estimates indicated high standardized factor loadings (.70 to .85). Reckless behavior at 9th grade had similar standardized factor loadings (.74 to .91).

In general, across all grades "riding a bike without a helmet" had the highest standardized factor loading, whereas "doing something daring" had the lowest standardized factor loadings. Overall, although model fit could not be used to test unidimensionality, the items had strong loadings on the factor and were conceptually

consistent with the construct and used in previous research to represent a reckless behavior factor (Gullone et al., 2000).

Rebellious behavior. Unidimensionality of the eight items related to rebellious behavior was tested in 5th grade. When these eight items were regressed onto a single latent factor, the model terminated normally. Model fit was excellent for these eight items, [χ^2 (20) = 48.919, $p < .001$, CFI = .977, TLI = .968, RMSEA = .039], with adequate standardized factor loadings (.57 to .97; see Table 6, Rebellious).

Unidimensionality of the same eight items related to rebellious behavior was tested in 6th grade. When these eight items were regressed onto a single latent factor, the model terminated normally. Model fit was acceptable, [χ^2 (20) = 78.630, $p < .001$, CFI = .980, TLI = .972, RMSEA = .055], with adequate standardized factor loadings (.58 to 97; see Table 6, Rebellious).

Unidimensionality of the same eight items related to rebellious behavior was tested in 9th grade. When these eight items were regressed onto a single latent factor, the model terminated normally. Model fit was acceptable for these eight items according to the relative fit indexes, but the absolute fit index indicated poor model fit, [χ^2 (20) = 306.750, $p < .001$, CFI = .973, TLI = .962, RMSEA = .126]. Conceptually, the substance abuse items (alcohol, tobacco, and marijuana) were related and therefore were expected to share common specificity. The residuals were correlated for these three items. This model, with correlated residuals, indicated acceptable fit, [χ^2 (17) = 121.145, $p < .001$, CFI = .991, TLI = .985, RMSEA = .08]. Standardized factor loadings were adequate (.63 to .89; see Table 6, Rebellious).

For the most part, across all grades "substance use" had the highest standardized factor loadings, whereas "running away" had the lowest standardized factor loadings. Overall, the items corresponding to rebellious behavior were supportive of a unidimensional factor structure at 5th and 6th grades. At 9th grade there was shared specific variance for the substance use items unrelated to the common factor.

Antisocial behavior. Unidimensionality of the eight items related to antisocial behavior was tested in 5th grade. When these eight items were regressed onto a single latent factor, the model terminated normally. Model fit was excellent for these eight items, [χ^2 (20) = 35.966, $p < .05$, CFI = .985, TLI = .978, RMSEA = .029], with adequate standardized factor loadings (.56 to .81; see Table 6, Antisocial).

Unidimensionality of the same eight items related to antisocial behavior was tested in 6th grade. When these eight items were regressed onto a single latent factor, the model terminated normally. Model fit was excellent for these eight items, [χ^2 (20) = 28.967, $p = .09$, CFI = .992, TLI = .989, RMSEA = .022], with adequate standardized factor loadings (.56 to .85; see Table 6, Antisocial).

Unidimensionality of the same eight items related to antisocial behavior was tested in 9th grade. When these eight items were regressed onto a single latent factor, the model terminated normally. Model fit was acceptable for these eight items, [χ^2 (20) = 76.189, $p < .001$, CFI = .984, TLI = .977, RMSEA = .056], with adequate standardized factor loadings (.56 to .81; see Table 6, Antisocial).

For the most part, across all grades "threat" had the highest standardized factor loadings, whereas "hurting an animal" had the lowest standardized factor loadings.

Overall, the items corresponding to antisocial behavior supported a unidimensional factor structure at each time point.

Child-parent relationship quality. For child-parent relationship quality, two different models (closeness and conflict) were tested for unidimensionality.

Closeness. Unidimensionality of eight items related to closeness was tested in 5th grade. When these eight items were regressed onto a single latent factor, the model terminated normally. Model fit was acceptable according to the relative fit indexes but mediocre according to the RMSEA, [χ^2 (20) = 230.914, $p < .001$, CFI = .948, TLI = .927, RMSEA = .102]. Modification indices indicated that "share" and "open" items have common specific residual variance. These residual variances were correlated. This model resulted in excellent fit, [χ^2 (19) = 66.725, $p < .001$, CFI = .988, TLI = .983, RMSEA = .050], with adequate standardized factor loadings (.45 to .83; see Table 7, Closeness).

Unidimensionality of the same eight items related to closeness was tested in 6th grade. When these eight items were regressed onto a single latent factor, the model terminated normally. Model fit was acceptable according to the relative fit indexes but poor according to the absolute fit index, [χ^2 (20) = 297.554, $p < .001$, CFI = .948, TLI = .927, RMSEA = .117]. Modification indices indicated that "share" and "open" items have common specific residual variance. These residual variances were correlated. This model resulted in acceptable fit, [χ^2 (19) = 121.292, $p < .001$, CFI = .981, TLI = .972, RMSEA = .073], with adequate standardized factor loadings (.44 to .84; see Table 7, Closeness).

Unidimensionality of the same eight items related to closeness was tested in 9th grade. When these eight items were regressed onto a single latent factor, the model terminated normally. Model fit was acceptable according to the relative fit indexes but

poor according to the absolute fit index, [χ^2 (20) = 307.418, p < .001, CFI = .940, TLI = .916, RMSEA = .122]. Modification indices indicated that "share" and "open" items have common specific residual variance. These residual variances were correlated. This model resulted in acceptable fit, [χ^2 (19) = 162.638, p < .001, CFI = .970, TLI = .956, RMSEA = .088], with adequate standardized factor loadings (.44 to .79; see Table 7, Closeness).

For the most part, across all grades "sharing a warm/affectionate relationship," and "values his/her relationship with me" had the highest standardized factor loadings, whereas "child is uncomfortable with physical affection" had the lowest standardized factor loadings. Overall, the items corresponding to closeness were supportive of a unidimensional factor structure with correlated residuals between two items, which indicated shared specific variance unrelated to the common factor.

Conflict. Unidimensionality of seven items related to conflict was tested in 5th grade. When these seven items were regressed onto a single latent factor, the model terminated normally. Model fit was acceptable for these seven items, [χ^2 (14) = 129.621, p < .001, CFI = .980, TLI = .969, RMSEA = .090], with adequate standardized factor loadings (.65 to .80; Table 7, Conflict).

Unidimensionality of seven items related to conflict was tested in 6th grade. When these seven items were regressed onto a single latent factor, the model terminated normally. Model fit was acceptable for these seven items, [χ^2 (14) = 64.478, p < .001, CFI = .992, TLI = .988, RMSEA = .065], with adequate standardized factor loadings (.63 to .85; see Table 7, Conflict).

Unidimensionality of seven items related to conflict was tested in 9th grade. When these seven items were regressed onto a single latent factor, the model terminated normally. Model fit was acceptable for these seven items, [χ^2 (14) = 82.852, $p < .001$, CFI = .992, TLI = .988, RMSEA = .071], with adequate standardized factor loadings (.67 to .85; see Table 7, Conflict). For the most part, across all grades " child's feelings toward me can be unpredictable," "dealing with my child drains my energy," and " my child becomes easily angry at me" had the highest standardized factor loadings, whereas "child is sneaky/manipulative with me" had the lowest standardized factor loadings. Overall, the items corresponding to conflict supported a unidimensional factor structure at each time point.

Parcel Level Descriptive Statistics

Means, standard deviations, skewness, and kurtosis values are provided for individual risk behavior parcels (reckless, rebellious, and antisocial; see Table 2), peer risk behavior parcels (reckless, rebellious, and antisocial; see Table 3), and child-parent relationship quality parcels (closeness and conflict; see Table 4) for 5th, 6th, and 9th grades. The observed means for the individual risk behavior facet-representative parcels (reckless, rebellious, and antisocial) increased from 5th to 9th grade, though antisocial only slightly increased (see Table 2, Parcels). The observed means for the peer risk behavior facet-representative parcels (reckless, rebellious, and antisocial) increased from 5th to 9th grade (see Table 3, Parcels). The observed means for the child-parent relationship quality facet-representative parcels (closeness and conflict) changed from 5th to 9th grade, with decreases in closeness and increases in conflict (see Table 4, Parcels). The reliabilities of each of the facet-representative parcels for each construct (Individual Risk Behavior, Peer

Risk Behavior, and Child-Parent Relationship Quality) at each time point were calculated as coefficient alphas. The reliabilities of the parcels for individual risk behavior (α = .335 to .766), peer risk behavior (α = .662 to .872), and child-parent relationship quality (α = .731 to .870) are all reported in Table 8. The reliability for individual rebellious behavior was relatively lower (α = .335) at 5th grade than at 6th (α = .531) or 9th grade (α = .766), which may have been due to developmental differences in engaging in risk behavior or in accuracy of self-report.

The individual risk behavior facet-representative parcels had skewness (-0.05 to 4.53) and kurtosis (-0.99 to 30.24) values beyond acceptable range for ML estimation procedures (see Table 2, Parcels). Furthermore, the peer risk behavior facet-representative parcels had skewness (-0.48 to 3.45) and kurtosis (-0.78 to 21.05) values in violation of accepted use for ML estimation (see Table 3, Parcels). The child-parent relationship quality facet-representative parcels, however, had skewness (-1.5 to -0.38) and kurtosis (-0.67 to 3.73) values within an acceptable range for use of ML estimation procedures. Nonetheless, all models were estimated using MLR estimation with the Satorra-Bentler scaled chi-square correction, which has shown "very good performance regardless of the degree of non-normality when using large samples" (West et al., 1995, p. 73).

Longitudinal CFA model. A longitudinal CFA model was constructed with three indicators (reckless, rebellious, and antisocial) per construct (individual risk behavior and peer risk behavior) across time. Child-parent relationship quality was constructed with two indicators (closeness and conflict) per construct across time (see Figure 4).

Research Question 1: Do the constructs Peer Risk Behavior, Individual Risk Behavior, and Child-Parent Relationship Quality demonstrate measurement invariance across early to middle stages of adolescence?

A longitudinal CFA model was estimated in which all latent factors were allowed to freely correlate within and across time. The latent factor intercorrelations are reported in Table 9. Individual Risk Behavior and Peer Risk Behavior within-time correlations were statistically significantly positively correlated (.82 to .86) for each grade, with the highest correlation at 6th grade. Peer Risk Behavior and Child-Parent Relationship Quality were statistically significantly negatively correlated (-.28 to -.30) at 6th and 9th grades only, whereas Individual Risk Behavior and Child-Parent Relationship Quality were statistically significantly negatively correlated (-.17 to -.36) at all grades, with the highest negative correlation at 9th grade.

A configural invariance model was estimated in which the pattern of free factor loadings was examined. Overall, the model fit was acceptable and indicated that configural invariance was tenable, [χ^2 (192) = 1673.75, $p < .001$, CFI = .940, TLI = .892, RMSEA = .086 $_{(.083–.090)}$]. However, the TLI indicated poor model fit. The standardized factor loadings were all statistically significant and loaded on their respective constructs, with adequate to high factor loadings (see Table 10). The standardized factor loadings for Peer Risk Behavior varied across all grades (.56 to .85), with antisocial behavior having the highest standardized factor loadings (.84 to .85). The standardized factor loadings for Individual Risk Behavior varied across all grades (.59 to .77), with antisocial behavior having the highest standardized factor loadings in 5th and 6th grades (.74 to .77) and rebellious behavior in 9th grade (.77). The standardized factor loadings did not vary as

much for Child-Parent Relationship Quality (.54 to .66), with the highest standardized factor loadings for closeness (.61 to .66). However, modification indices suggested that the same within-time indicator residuals for Peer Risk Behavior and Individual Risk Behavior should be correlated (i.e., peer antisocial residual with individual antisocial residual, peer rebellious residual with individual rebellious residual, and peer reckless residual with individual reckless residual). These were likely correlated because of common specific variance due to similar item content. A configural model was estimated with these method correlated residuals. Model fit was excellent, [χ^2 (183) = 737.60, p < .001, CFI = .978, TLI = .950, RMSEA = .054 $_{(.050–.058)}$]. Configural invariance was tenable (see Table 11, Model 2a).

Weak factorial invariance was tested by constraining corresponding factor loadings to be equal across time, while allowing the factor variances to vary across time. Weak factorial invariance was tenable based on the change in the CFI (ΔCFI = .009; see Table 11, Model 3). Model fit was acceptable [χ^2 (193) = 967.60, p < .001, CFI = .969, TLI = .938, RMSEA = .062 $_{(.058–.066)}$]. Factor loadings were proportionally the same across time. Since full longitudinal weak invariance was supported, strong invariance across time was tested. Furthermore, because weak invariance was supported, factor variances across time were tested for equivalence.

Strong factorial invariance was tested by constraining corresponding manifest intercepts to be equal across time, while allowing the latent means to vary across time. Strong factorial invariance was not tenable based on the change in the CFI (ΔCFI = .016; see Table 11, Model 4). Model fit was acceptable [χ^2 (203) = 1361.30, p < .001, CFI = .953, TLI = .917, RMSEA = .074 $_{(.070–.077)}$]. Full strong invariance was not supported.

Modification indices suggested that the intercept for peer rebellious behavior at 9th grade should be freed. After freeing this parameter, partial strong invariance remained untenable based on the change in the CFI (ΔCFI = .013; see Table 11, Model 4a). Modification indices suggested that the intercept for peer reckless behavior at 5th grade should be freed. Compared to the weak invariant model, this model was supported based on the change in the CFI (ΔCFI = .01; see Table 11, Model 4b). Model fit was acceptable [χ^2 (201) = 1216.28, $p < .001$, CFI = .959, TLI = .925, RMSEA = .069 $_{(.066–.073)}$]. Only weak invariance was supported for the Peer Risk Behavior construct. Comparisons of the latent mean structures for Peer Risk Behavior were not possible since the same two intercepts per factor were not invariant across time (i.e., the latent mean contained different mean information at different time points). Differences in the latent means cannot explain differences in the observed means across time for Peer Risk Behavior. However, full strong invariance was supported for Individual Risk Behavior and Child-Parent Relationship Quality, which indicates that any differences in the observed means can be accounted for by differences in the latent means. Furthermore, because full strong invariance was tenable for Individual Risk Behavior and Child-Parent Relationship Quality, comparisons of the latent mean structures for Individual Risk Behavior and Child-Parent Relationship Quality were possible.

Summary

In the measurement model, weak invariance was supported for Peer Risk Behavior across time. Full strong invariance was supported for Individual Risk Behavior and Child-Parent Relationship Quality across time. The factor loadings corresponding to Individual Risk Behavior and Peer Risk Behavior (reckless, rebellious, and antisocial)

were represented in similar proportions from early to middle adolescence. The factor loadings for Child-Parent Relationship Quality (closeness and conflict) were represented in correspondingly similar proportions from early to middle adolescence. These findings mostly allowed the second research question to be addressed. Because weak invariance was only found for Peer Risk Behavior, a comparison of the latent mean structures was not possible. Full strong invariance was supported for Individual Risk Behavior and Child-Parent Relationship Quality therefore a comparison of the latent mean structures was possible. Furthermore, all corresponding factor loadings were statistically equivalent across time therefore a comparison of the factor variances was possible.

Research Question 2: Do the constructs Peer Risk Behavior, Individual Risk Behavior, and Child-Parent Relationship Quality demonstrate structural invariance across early to middle stages of adolescence?

Because full strong invariance for Individual Risk Behavior and Child-Parent Relationship Quality was supported, it was acceptable to test invariance of the latent parameters (i.e., factor variances, latent means) across time. However, only weak invariance was supported for Peer Risk Behavior, so only invariance of the factor variances across time was allowed. Because testing invariance of the latent parameters involves no measurement error, the chi-square difference test using the Satorra-Bentler scaled chi-square (S-B $\Delta\chi^2$) was used with non-invariance of the latent parameters indicated at $p < .05$.

An omnibus test of equivalent factor variances was performed (since full weak invariance was tenable), in which all corresponding factor variances were constrained to equality across time. This model was compared to the final invariant measurement model

(Model 4b). The S-B χ^2 difference test was statistically significant, [S-B $\Delta\chi^2$ (6) = 93.76, $p < .001$, CFI = .953, TLI = .919, RMSEA = .073 $_{(.069–.077)}$], indicating that the corresponding factor variances were not statistically equivalent across time (see Table 11, Model 5).

Next, follow-up tests were performed on each construct to determine if the model misfit was attributed to a specific construct. When the Peer Risk Behavior construct factor variances were constrained to equality across time, the S-B χ^2 difference test was statistically significant, [S-B $\Delta\chi^2$ (2) = 60.45, $p < .001$, CFI = .953, TLI = .917, RMSEA = .074 $_{(.070–.078)}$], indicating the factor variances were not equivalent (see Table 11, Model 5a). The factor variances for Peer Risk Behavior were freed and further examined. The factor variance for Peer Risk Behavior indicates that the distribution of Peer Risk Behavior becomes more heterogeneous over time, with an increase in variability from 5th to 6th grade (56% increase), and from 6th to 9th grade (156% increase).

When the Individual Risk Behavior construct factor variances were constrained to equality across time, the S-B χ^2 difference test was statistically significant, [S-B $\Delta\chi^2$ (2) = 20.58, $p < .001$, CFI = .958, TLI = .924, RMSEA = .070 $_{(.066–.074)}$], indicating the factor variances were not equivalent (see Table 11, Model 5b). The factor variances for Individual Risk Behavior were freed and further examined. The factor variance for Individual Risk Behavior indicates that the distribution of Individual Risk Behavior becomes more heterogeneous over time, with an increase in variability from 5th to 6th grade (33% increase), and from 6th to 9th grade (63% increase).

When the Child-Parent Relationship Quality construct factor variances were constrained to equality across time, the S-B χ^2 difference test was statistically significant,

[S-B $\Delta\chi^2$ (2) = 11.63, p < .003, CFI = .958, TLI = .925, RMSEA = .069 $_{(.066–.073)}$], indicating the factor variances were not equivalent (see Table 11, Model 5c). The factor variances for Child-Parent Relationship Quality were freed and further examined. The factor variance for Child-Parent Relationship Quality indicates that the distribution of Child-Parent Relationship Quality becomes more heterogeneous from 5th to 6th grade (with a 29% increase in variability), but is homogeneous from 6th to 9th grade (factor variances were equivalent).

An omnibus test of equivalent latent means was performed for Individual Risk Behavior and Child-Parent Relationship Quality (since full strong invariance was tenable), in which all corresponding latent means were constrained to equality across time. A test of equivalent latent means for Peer Risk Behavior was not performed since the same intercepts per factor were not invariant across time. The S-B χ^2 difference test was statistically significant, [S-B $\Delta\chi^2$ (4) = 538.86, p < .001, CFI = .946, TLI = .908, RMSEA = .079 $_{(.075–.082)}$], indicating that the corresponding latent means were not statistically equivalent across time (see Table 11, Model 6). Next, follow-up tests were performed on Individual Risk Behavior and Child-Parent Relationship constructs to determine if the model misfit was attributed to a specific construct.

When the Individual Risk Behavior latent means were constrained to equality across time, the S-B χ^2 difference test was statistically significant, [S-B $\Delta\chi^2$ (2) = 204.24, p < .001, CFI = .954, TLI = .919, RMSEA = .073 $_{(.069–.077)}$], indicating the latent means were not equivalent (see Table 11, Model 6a). The latent means for Individual Risk Behavior were freed and further examined. The latent means for Individual Risk Behavior were statistically equivalent from 5th to 6th grade. The latent means from 6th to

9th grade differed with an increase from 6th to 9th grade (see Table 12, Individual Risk). The effect size of the latent mean difference from 6th to 9th grade indicated a medium effect size (ES = .48).

When the Child-Parent Relationship Quality latent means were constrained to equality across time, the S-B χ^2 difference test was statistically significant, [$\Delta\chi^2$ (2) = 273.98, $p < .001$, CFI = .949, TLI = .911, RMSEA = .077 $_{(.073–.081)}$], indicating the latent means were not equivalent (see Table 11, Model 6b). The latent means for Child-Parent Relationship Quality were freed and further examined. The latent means for Child-Parent Relationship Quality decrease from 5th to 9th grade primarily from 6th to 9th grade (see Table 12, Child-Parent). Standardized effect sizes of the latent mean differences across time indicated a small effect size (ES = -.11) from 5th to 6th grade and a medium effect size (ES = -.55) from 6th to 9th grade.

Summary

The findings from testing invariance of the latent parameters indicated a lack of equivalent factor variances for Peer Risk Behavior and Individual Risk Behavior, in which both become increasingly heterogeneous across early to middle adolescence. Furthermore, this differentiation occurred mostly in the time period from 6th to 9th grade. The Child-Parent Relationship Quality factor variance was increasingly heterogeneous from the 5th to 6th grade transition, but was homogenous from 6th to 9th grade. Peer Risk Behavior became more variable than Individual Risk Behavior over time.

The latent mean for Individual Risk Behavior was equivalent from 5th to 6th grade, but increased from 6th to 9th grade. The latent mean for Child-Parent Relationship Quality differed across time and indicated a decrease over time. Though the latent means for Peer

Risk Behavior could not be compared across time, the observed means indicated an increase over time.

Research Question 3: How are Peer Risk Behavior, Individual Risk Behavior, and Child-Parent Relationship Quality constructs related to themselves and each other across early to middle stages of adolescence?

To examine the regression pathways between Peer Risk Behavior, Individual Risk Behavior, and Child-Parent Relationship Quality, a longitudinal CFA cross-lagged panel model was fit to longitudinal panel data (Little et al., 2007). The latent cross-lagged panel models were fit to the final invariant measurement model (see Table 11, Model 4b). In order to provide equal interval measurement of the regression pathways (i.e., autoregressive and cross-lagged pathways), phantom variables were used for discrete time points, 7th and 8th grades, which allowed continuous time modeling despite missing data (Oud & Voelkle, 2014). All possible regression pathways that were tested in the cross-lagged panel model are shown in Figure 5. Two different models were tested in sequential fashion, one without covariates (unconditional model) and one with covariates (conditional model). Next, a multi-group longitudinal panel model was estimated to test invariance of the latent regression pathways across gender. Substantive model evaluation was conducted using the χ^2 difference test with the Satorra-Bentler scaled chi-square (S-B $\Delta\chi^2$). Statistically significant differences were indicated at an alpha level of $< .05$.

Unconditional model. The model with freely estimated latent covariances was replaced with a model with autoregressive pathways and within-time correlations (cross-time, cross-construct latent covariances were fixed to zero) across 5th through 9th grade

(see Table 13, Mode 1). Corresponding autoregressive pathways were constrained to be equivalent.

Model fit was acceptable, [χ^2 (226) = 1346.20, $p < .001$, CFI = .955, TLI = .927, RMSEA = .069 $_{(.065–.072)}$], with statistically significant positive autoregressive coefficients for Peer Risk Behavior, Individual Risk Behavior, and Child-Parent Relationship Quality. There were statistically significant positive with-time correlations/residual correlations between Peer Risk Behavior and Individual Risk Behavior. Child-Parent Relationship Quality had negative within-time correlations/residual correlations with Peer Risk Behavior and Individual Risk Behavior.

The same model was estimated except that the corresponding autoregressive pathways from 8th to 9th grade were freed (see Table 13, Model 2). This was a test of whether the corresponding autoregressive pathways were statistically significantly different from each other. Model fit was not statistically significantly improved from the model in which all corresponding autoregressive parameters were set to equality, [S-B $\Delta\chi^2$ (3) = 1.71, p = .640, CFI = .954, TLI = .925, RMSEA = .070 $_{(.066–.073)}$], therefore, the more parsimonious model was retained (Model 1).

The next step was to include cross-lagged pathways. Corresponding cross-lagged pathways were constrained to be equivalent across time. This model resulted in a statistically significant improvement in model fit, [S-B $\Delta\chi^2$ (6) = 95.81, $p < .001$, CFI = .958, TLI = .930, RMSEA = .067 $_{(.063–.070)}$], indicating that constructs at previous time points explained changes in different constructs at future time points, even while controlling for previous levels of a construct (see Table 13, Model 3). The only statistically significant cross-lagged pathways, however, were from Individual Risk

Behavior to Peer Risk Behavior, at all time points. Non-statistically significant cross-lagged pathways (i.e., Peer Risk Behavior to Individual Risk Behavior and Child-Parent Relationship Quality, and Child-Parent Relationship Quality to Individual Risk Behavior and Peer Risk Behavior) were fixed to zero. Model fit was not statistically significantly different from the model in which all corresponding cross-lagged parameters (significant and non-significant) were included in the model, [S-B $\Delta\chi^2$ (5) = 2.35, p = .805, CFI = .958, TLI = .931, RMSEA = .066 $_{(.063–.070)}$], further verifying that Peer Risk Behavior didn't affect subsequent Individual Risk Behavior or Child-Parent Relationship Quality and that Child-Parent Relationship Quality didn't affect subsequent Peer Risk Behavior or Individual Risk Behavior. The most parsimonious model (Table 13, Model 4) was retained, with only cross-lagged pathways from Individual Risk Behavior to Peer Risk Behavior, at all time points. Last, the same model was estimated except that the cross-lagged pathway from 8th to 9th grade was freed (see Table 13, Model 5). This was a test of whether the cross-lagged pathways from Individual Risk Behavior to Peer Risk Behavior were statistically significantly different from 5th to 8th grade versus 8th to 9th grade (i.e., the cross-lagged pathways were constrained to be equal from 5th to 8th grade and freed from 8th to 9th grade). Model fit was not statistically significantly improved from the model in which all corresponding cross-lagged parameters were set to equality, [S-B $\Delta\chi^2$ (1) = 3.44, p = .064, CFI = .958, TLI = .931, RMSEA = .066 $_{(.063–.070)}$], therefore, the more parsimonious model was retained (Model 5). This indicated that the effect of Individual Risk Behavior on Peer Risk Behavior was similar in magnitude across all time points (i.e., was not moderated by developmental stages).

The final unconditional model (Model 5) is shown in Figure 6. In the final unconditional model the corresponding autoregressive pathways for Individual Risk Behavior[1] (β = .63 to .77) and Child-Parent Relationship Quality (β = .59 to .76) indicated they were stable across time (i.e., corresponding autoregressive coefficients were high and equivalent). The development of these independent constructs was stable across time, indicating a simplex pattern (Little, 2013). Peer Risk Behavior (β = .23 to .42) was less stable across time (i.e., autoregressive coefficients were lower but equivalent) than Individual Risk Behavior and Child-Parent Relationship Quality. The cross-lagged pathway from Individual Risk Behavior to Peer Risk Behavior (β = .33 to .62) was statistically equivalent across time. This finding indicated that after controlling for previous Peer Risk Behavior, previous Individual Risk Behavior explains individual differences in future Peer Risk Behavior. For example, after controlling for previous Peer Risk Behavior in 5th grade, a one standard deviation increase in Individual Risk Behavior at 5th grade resulted in a .48 standard deviation increase in Peer Risk Behavior at 6th grade.

Summary

The findings from the final unconditional model indicated that all corresponding autoregressive pathways for Peer Risk Behavior, Individual Risk Behavior, and Child-Parent Relationship Quality were statistically equivalent from 5th through 9th grades. Individual Risk Behavior and Child-Parent Relationship Quality were stable across time, whereas Peer Risk Behavior was relatively less stable, but statistically equivalent across

[1] The standardized estimates for Individual Risk Behavior and Child-Parent Relationship Quality from 6th to 8th grade were 1 because 7th and 8th grade had no variance, and have only one predicted pathway (i.e., the autoregressive pathways), whereas Peer Risk Behavior has two predicted pathways from which to extract variance used to scale the unstandardized pathway into the standardized.

time. When controlling for previous levels of Peer Risk Behavior, Individual Risk Behavior predicted future changes in Peer Risk Behavior (i.e., Individual Risk Behavior explained individual differences in Peer Risk Behavior beyond previous levels of Peer Risk Behavior). When controlling for previous levels of Individual Risk Behavior, Peer Risk Behavior did not explain changes in future Individual Risk Behavior (i.e., there was no reciprocal relationship between the two). The with-time correlations suggest that Peer Risk Behavior and Individual Risk Behavior are strongly related concurrently but when previous levels are controlled for, only previous Individual Risk Behavior explains individual differences in future Individual Risk Behavior. Child-Parent Relationship Quality did not explain changes in Peer or Individual Risk Behavior, or vice versa (i.e., Child-Parent Relationship Quality had no unidirectional or bidirectional relationships). Child-Parent Relationship Quality did have negative within-time correlations with Peer Risk Behavior and Individual Risk Behavior, suggesting that they may only be related concurrently.

Conditional model. In the conditional model, the same steps were repeated from the unconditional model testing, except with the inclusion of covariates (i.e., Race/Ethnicity, Gender, and SES) at each step to increase the validity of model estimates. In the conditional model, the constructs at 5th grade (Peer Risk Behavior, Individual Risk Behavior, and Child-Parent Relationship Quality) were all regressed (conditioned) onto these covariates to control for demographic influences. The covariates were only included for the first time point (5th grade), in which it was presumed that the downstream effects (at later time points) of these covariates operated through the latent variables at 5th grade.

First, the model with freely estimated latent covariances (see Figure 4) was replaced with a model with autoregressive pathways and within-time correlations (cross-time, cross-construct latent covariances were fixed to zero) across 5th through 9th grades, while simultaneously conditioning the constructs at 5th grade onto the covariates (see Table 13, Mode 6). Corresponding autoregressive pathways were constrained to be equivalent. Model fit was acceptable, [S-B χ^2 (331) = 1739.93, $p < .001$, CFI = .943, TLI = .935, RMSEA = .064 $_{(.061–.067)}$], with statistically significant positive autoregressive coefficients for Peer Risk Behavior, Individual Risk Behavior, and Child-Parent Relationship Quality. There were statistically significant positive with-time correlations/residual correlations between Peer Risk Behavior and Individual Risk Behavior. Child-Parent Relationship Quality had negative within-time correlations/residual correlations with Peer Risk Behavior and Individual Risk Behavior. Second, the same model was estimated except that the autoregressive pathways from 8th to 9th grade were freed (see Table 13, Model 7). This was a test of whether the corresponding autoregressive pathways were statistically significantly different from each other. Model fit was not statistically significantly improved from the model in which all corresponding autoregressive parameters were set to equality, [S-B $\Delta\chi^2$ (3) = 0.99, p = .803, CFI = .942, TLI = .934, RMSEA = .064 $_{(.061–.067)}$], therefore, the more parsimonious model was retained (Model 6).

The next step was to include cross-lagged pathways. Corresponding cross-lagged pathways were constrained to be equivalent across time. This model resulted in a statistically significant improvement in model fit, [S-B $\Delta\chi^2$ (6) = 96.57, $p < .001$, CFI = .947, TLI = .938, RMSEA = .062 $_{(.059–.065)}$], indicating that constructs at previous time

points explained changes in different constructs at future time points, even while controlling for previous levels of a construct (see Table 13, Model 8). The only statistically significant cross-lagged pathways, however, were from Individual Risk Behavior to Peer Risk Behavior, at all time points. Non-statistically significant cross-lagged pathways (i.e., Peer Risk Behavior to Individual Risk Behavior and Child-Parent Relationship Quality, and Child-Parent Relationship Quality to Individual Risk Behavior and Peer Risk Behavior) were fixed to zero. Model fit was not statistically significantly different from the model in which all corresponding cross-lagged parameters (significant and non-significant) were included in the model, [S-B $\Delta\chi^2$ (5) = 3.84, p = .573, CFI = .947, TLI = .939, RMSEA = .062 $_{(.059–.065)}$], further verifying that Peer Risk Behavior didn't affect Individual Risk Behavior or Child-Parent Relationship Quality and that Child-Parent Relationship Quality didn't affect Peer Risk Behavior or Individual Risk Behavior. The most parsimonious model (Table 13, Model 9) was retained, with only cross-lagged pathways from Individual Risk Behavior to Peer Risk Behavior. Last, the same model was estimated except that the cross-lagged pathway from 8th to 9th grade was freed (see Table 13, Model 10). This was a test of whether the cross-lagged pathways from Individual Risk Behavior to Peer Risk Behavior were statistically significantly different from 5th to 8th grade versus 8th to 9th grade (i.e., the cross-lagged pathways were constrained to be equal from 5th to 8th grade and freed from 8th to 9th grade). Model fit was not statistically significantly improved from the model in which all corresponding cross-lagged parameters were set to equality, [S-B $\Delta\chi^2$ (1) = 3.25, p = .062, CFI = .947, TLI = .938, RMSEA = .062 $_{(.059–.065)}$], therefore, the more parsimonious model was

retained (Model 9). This indicated that the effect of Individual Risk Behavior on Peer Risk Behavior was similar in magnitude across all time points.

The final conditional model (Model 9) is shown in Figure 7. In the final conditional model the corresponding autoregressive pathways for Individual Risk Behavior (β = .66 to .79) and Child-Parent Relationship Quality (β = .59 to .76) indicated they were stable across time (i.e., corresponding autoregressive coefficients were high and equivalent). The development of these constructs was stable across time, indicating a simplex pattern (Little, 2013). Peer Risk Behavior (β = .25 to .43) was less stable across time (i.e., autoregressive coefficients were lower but equivalent) than Individual Risk Behavior and Child-Parent Relationship Quality. The cross-lagged pathway from Individual Risk Behavior to Peer Risk Behavior (β = .33 to .61) was statistically equivalent across time. This indicates that after controlling for previous Peer Risk Behavior, previous Individual Risk Behavior explains individual differences in future Peer Risk Behavior. For example, after controlling for previous Peer Risk Behavior in 5th grade, a one standard deviation increase in Individual Risk Behavior at 5th grade resulted in a .48 standard deviation increase in Peer Risk Behavior at 6th grade. Parameter estimates are shown in Table 14 and the within-time correlations/residual correlations are shown in Table 15.

The inclusion of the covariates (Race/Ethnicity, Gender, SES) did not affect the salient effects found within the unconditional model; they were similar with or without covariates (within standard errors). All covariates had statistically significant associations with Peer Risk Behavior and Individual Risk Behavior (see Table 16). Males had higher levels of Peer Risk Behavior and Individual Risk Behavior than females at 5th grade.

Gender was not statistically significantly different from zero for Child-Parent Relationship Quality, indicating that there were not gender differences in the means. SES was negatively related to Peer Risk Behavior and Individual Risk Behavior, indicating that higher SES was associated with lower levels of peer and individual risk. SES was positively related to Child-Parent Relationship Quality, indicating that, on average, higher SES was associated with better child-parent relational quality. For race/ethnicity, only Black adolescent ratings were statistically significantly different from Whites, with Blacks associated with higher levels of peer and individual risk and lower levels of relational quality.

Last, the proportion of variance explained in Peer Risk Behavior by the autoregressive and cross-lagged pathways varied across time (33% to 59%), whereas the covariates explained approximately 16% of the variance in Peer Risk Behavior in 5th grade (see Table 14, Proportion of Variance Explained). Previous levels of Individual Risk Behavior explained 44% to 62% of the variance in future Individual Risk Behavior, while the covariates explained 17% of the variance in Individual Risk Behavior in 5th grade. Last, previous levels of child-parent relationship quality explained 35% to 58% of the variance in future Child-Parent Relationship Quality, but the covariates only explained 2% of the variance in Child-Parent Relationship Quality in 5th grade.

Summary

The findings from the final unconditional model did not differ from the final conditional model in any meaningful way (within standard errors). The final conditional model indicated that all corresponding autoregressive pathways for Peer Risk Behavior, Individual Risk Behavior, and Child-Parent Relationship Quality were statistically

equivalent from 5th through 9th grades. Individual Risk Behavior and Child-Parent Relationship Quality were stable across time, whereas Peer Risk Behavior was relatively less stable across time. When controlling for previous levels of Peer Risk Behavior, Individual Risk Behavior predicted future changes in Peer Risk Behavior (i.e., Individual Risk Behavior explained individual differences in Peer Risk Behavior beyond previous levels of Peer Risk Behavior). When controlling for previous levels of Individual Risk Behavior, Peer Risk Behavior did not explain changes in future Individual Risk Behavior (i.e., there was no reciprocal relationship between the two). The with-time correlations suggest that Peer Risk Behavior and Individual Risk Behavior are strongly related concurrently but when previous levels are controlled for, only previous Individual Risk Behavior explains individual differences in future Individual Risk Behavior. Child-Parent Relationship Quality did not predict changes in Peer or Individual Risk Behavior, or vice versa (i.e., Child-Parent Relationship Quality had no unidirectional or bidirectional relationships). Child-Parent Relationship Quality did have negative within-time correlations with Peer Risk Behavior and Individual Risk Behavior, suggesting that they may only be related concurrently.

Multi-group longitudinal CFA model. A longitudinal multi-group CFA model was estimated to test invariance of the latent regression pathways across gender. The least constrained models were used for each gender group, in which all autoregressive and cross-lagged pathways were included in a base model and tested against a model in which all corresponding regression pathways were constrained to be equal across gender groups. This was completed using the unconditional and conditional models, except gender was not included as a covariate in the conditional model (since it was tested across gender).

Invariance of the latent regression pathways across gender groups was tenable in the unconditional model, [S-B $\Delta\chi^2$ (9) = 14.63, p = .102, CFI = .955, TLI = .957, RMSEA = .068 $_{(.065–.072)}$]. Invariance of the latent regression pathways across gender groups was also tenable in the conditional model, [S-B $\Delta\chi^2$ (9) = 14.48, p = .106, CFI = .949, TLI = .963, RMSEA = .062 $_{(.059–.066)}$]. This indicates that even though there were gender differences in the means, there were not in the regression pathways. Model fit statistics are reported in Table 17.

Research Question 4: Is the effect of Child-Parent Relationship Quality on Individual Risk Behavior mediated by Peer Risk Behavior (i.e., does Child-Parent Relationship Quality have an indirect effect on Individual Risk Behavior via Peer Risk Behavior)?

Longitudinal mediation tests whether the effect of one variable on another is mediated by a third variable (also called an intervening variable). The mediator can be thought of as the "carrier" between the predictor and the outcome (Little, 2013). To test whether the effect of Child-Parent Relationship Quality on Individual Risk Behavior was mediated by Peer Risk Behavior, bootstrapping in M*plus* was utilized. This method tests mediation by assessing whether the product of the indirect pathways is statistically significantly different from zero. Full longitudinal mediation can be tested despite having non-significant regression pathways in the cross-lagged panel model, as the mediation pathway can have a substantially different error structure than its constituent pathways (Preacher & Hayes, 2004). The multiplicative product of the indirect effects may be statistically significant; therefore, mediation can exist without having individual

pathways be statistically significant. Full longitudinal mediation was tested in both the unconditional and conditional models.

In order to test whether the Child-Parent Relationship Quality, Peer Risk Behavior, and Individual Risk Behavior mediation chain was statistically significantly different from zero, the product of the indirect effects was examined for statistical significance using 1,000 bias-corrected bootstrap draws. The product of the cross-lagged pathways from Child-Parent Relationship Quality at 5th grade to Peer Risk Behavior at 6th grade and Peer Risk Behavior at 6th grade to Individual Risk Behavior at 7th grade was calculated in M*plus*. This procedure was done for all possible mediation chains for Child-Parent Relationship Quality to Peer Risk Behavior to Individual Risk Behavior (i.e., 5th to 6th to 7th, 6th to 7th to 8th, 7th to 8th to 9th). The multiplicative product of the indirect pathways for Child-Parent Relationship Quality to Peer Risk Behavior to Individual Risk Behavior for all time points indicated a lack of longitudinal mediation (all 95% confidence intervals contained zero).

Summary

Full longitudinal mediation was tested to assess whether Child-Parent Relationship Quality had an effect on Individual Risk Behavior via Peer Risk Behavior. These tests indicated a lack of full longitudinal mediation, that is, the effect of Child-Parent Relationship Quality on Individual Risk Behavior via Peer Risk Behavior was not supported.

Chapter V: Discussion

The purpose of this study was to better understand the development of risk behavior using two different sociological theories: the group socialization theory (Harris, 1995) and the stage-environment fit theory (Eccles, et al., 1993). Specifically, this study used longitudinal latent variable models to clarify the influences of risky peers and child-parent relationship quality on subsequent individual risk behavior, and vice versa, in early to middle adolescence. The discussion is broken into four different sections: (a) the two sociological theories compared with the findings of the current study reconciled with previous studies, (b) implications for theory and practice, (c) limitations of the current study, and (d) general conclusions and future directions.

In general, this study offered several findings. First, similar measurement of the constructs used in this study across different stages of adolescent development was mostly supported (full strong invariance for Individual Risk Behavior and Child-Parent Relationship Quality, only weak invariance for Peer Risk Behavior), which permitted more accurate comparisons of the inter-latent variable relations across time. Second, a test of latent means indicated that while individual risk behavior increased over time (observed means for peer risk behavior increased), child-parent relationship quality decreased. Moreover, consistent with most developmental research, the factor variances were increasingly variable over time, except for child-parent relationship quality, which was similar in middle adolescence. Third, individual risk behavior and child-parent relationship quality were stable across time, whereas peer risk behavior was less stable. Fourth, findings clearly supported a consistent unidirectional influence, in which individual risk explained changes in subsequent peer risk throughout adolescence. There

were no other relational influences once previous levels of each construct were controlled. Last, peers did not mediate the influence of child-parent relationship quality on individual risk behavior. These findings are discussed in the context of the group socialization theory and the stage-environment fit theory.

Group Socialization Theory

According to Harris's group socialization theory (1995), peers are more important than parents in the shaping of personality. Groups serve as a reference for social comparison, which individuals then use to measure appropriate conduct and attitudes. These attitudes and behavior, in turn, influence one's own individual attitudes and behavior.

The current study found limited support for the group socialization theory. Once previous levels of individual risk behavior were controlled, peer risk behavior did not explain changes in subsequent individual risk behavior. In contrast, individual risk behavior explained changes in subsequent peer risk behavior, even after controlling for previous levels of peer risk behavior. Interestingly, individual risk behavior and peer risk behavior were strongly related within time (increasingly so throughout later adolescent stages; *r*'s = .65 to .77), suggesting that peers may have influence on individuals when measured concurrently, but the amount of peer risk behavior does not influence individual risk behavior at subsequent time points. Individuals may influence peer groups because individuals may self-categorize themselves into groups based on identity formation or align with those of similar personalities.

In partial support of the group socialization theory was the finding that child-parent relationship quality, indicated primarily by the mother's perception of the child-

parent relationship, did not explain subsequent individual risk behavior once previous levels of individual risk behavior were controlled. The within-time relation between child-parent relationship quality and individual risk behavior showed that they were inversely related (*r*'s = -.11 to -.39) throughout the adolescent stages of development and that the relation increased. These correlations were weaker than the within time correlations between individual risk behavior and peer risk behavior (*r*'s = .65 to .77). Given the current model, the findings suggest that previous levels of individual risk behavior were the only reliable predictor of future levels of individual risk behavior.

Previous research also failed to fully support group socialization theory, although the findings from the current study also diverged from those studies in some ways. For example, Van Ryzin and colleagues (2012) also found that individual risk behavior explained subsequent peer risk behavior in the early to middle adolescent stages when using a cross-lagged panel model. However, Van Ryzin et al. also found statistically significant effects for peer risk behavior on subsequent tobacco use throughout early to middle adolescence and on subsequent alcohol and marijuana use at age 13 (but not in 9th grade). They also found, unlike the current study, reciprocal effects between individual risk behavior and child-parent relationship quality in middle adolescence. The findings may have differed because Van Ryzin et al. used a substance use measure within their study (viz., tobacco, alcohol, marijuana), whereas the current study modeled a general construct of risk behavior (with substance use modeled as an aspect of rebellious behavior, which was then used as an indicator of general risk behavior). Furthermore, their study included a deviant peer association variable (i.e., "how many times during the past week they had spent time with peers who engaged in deviant behaviors"), whereas

the current study included a slightly different peer risk behavior variable (i.e., "how many of his/her friends have ever engaged in a number of different risky behaviors"). Therefore differences in the wording of the questions ("how much time they spent with peers who demonstrated risk behavior" versus "how many of their peers engaged in risk behavior"), differences in the time sampled ("in the past week" versus "ever"), and differences in the response scaling of the questionnaire ("0–7" versus "0–2") may have all affected the results.

Other research has also failed to fully support the group socialization theory. A research study by Pardini and colleagues (2005) had some overlap with the current study. The Pardini et al. study found that beliefs about risk behavior (individual risk behavior) influenced subsequent peer group risk behavior but only in the middle to late stages of adolescent development (9th to 10th and 10th to 11th). However, peer groups influenced subsequent individual risk behavior throughout all stages of adolescence (with reciprocal effects in middle to late adolescence). Additionally, child-parent relationship quality (only modeled as conflict) influenced subsequent individual risk behavior at one time point (6th to 7th grade) and subsequent peer groups at two different time points (6th to 7th and 8th to 9th), albeit with small effects. The differences between the Pardini et al. (2005) study and the current study may be attributed to differences in the latent variables used. The Pardini et al. study used a latent construct about *beliefs* of risk behavior, not actual risk behavior. Furthermore, the child-parent relationship quality variable was modeled as a family conflict variable, whereas the current study included closeness and conflict as indicators of a child-parent relationship quality latent variable. In addition, although the Pardini et al. study included a deviant peer association variable (i.e., "how many of their

friends engaged in a specific delinquent act over the past year") that was similar to peer risk behavior variable in the current study (i.e., "how many of his/her friends have ever engaged in a number of different risky behaviors"), there were differences in the time sampled ("in the past year" versus "ever"), and differences in the response scaling of the questionnaire ("0–4" versus "0–2"), which may have affected the findings.

Stage-Environment Fit Theory

The stage-environment fit theory asserts that both parents and peers are important in shaping adolescent behavior, but the relative influences depend on the developmental stage (Eccles et al., 1993). Specifically, due to stage-environment misfit, both parent and peer influences shift in early adolescence with peer influences becoming increasingly more important than parent influences. The current study did not find any support for either peer or parent influences on subsequent individual risk behavior.

Once previous levels of individual risk behavior were controlled, peer risk behavior did not explain changes in subsequent individual risk behavior. However, peer risk behavior and individual risk behavior were strongly related within time across early to middle adolescence. Although the two behaviors may be related within time, peer risk behavior does not influence general risk at subsequent time points when controlling for previous levels.

In the current study, child-parent relationship quality and individual risk behavior did not have reciprocal influences (or unidirectional influences) across early to middle adolescence, though small effects have been found at one or two time points in early to middle adolescence (Pardini et al., 2005; Van Ryzin et al., 2012). Other studies that have found influences between child-parent relationship quality and individual risk behavior

have not used longitudinal models, unable to control for previous levels (Bogenschneider et al., 1998; Dekovic, 1999; Michael & Ben-Zur, 2007). The only relationship between child-parent relationship quality and individual risk behavior, which was an inverse relationship, was found when they were measured concurrently. However, in accordance with the stage-environment fit theory, child-parent relationship quality decreased throughout the stages of adolescent development. An examination of the observed mean differences indicated that increased levels of conflict were concomitant with decreased levels of closeness over time. It followed that there were latent mean decreases in child-parent relationship quality from early to middle adolescence. These findings support previous research, which has found similar levels of increased conflict and decreased closeness throughout the adolescent stages of development (Gutman et al., 2011; Gutman & Eccles, 2007). In this study, the child-parent relationship quality variable may be indicative of the mothers' adjustment to their relationship with their child during early to middle adolescence, which suggests increased maladjustment throughout adolescence.

Last, the influence of child-parent relationship quality on individual risk behavior via peer risk behavior was not supported in this study. This finding is not altogether surprising considering that previous research has found small indirect effects of child-parent relationship quality on individual risk behavior via peer risk behavior (Pardini et al., 2005; Van Ryzin et al., 2012). Though other research has found a statistically significant indirect effect of parental influence on individual risk behavior via peer groups (Bogenschneider et al., 1998), that study did not use longitudinal models to control for previous levels of each behavior.

Implications for Theory and Practice

The findings from the current study did not for the most part support the inter-variable relations hypothesized by the two sociological theories used in this study. The main finding of this study showed that individual risk behavior explained individual differences in subsequent peer risk behavior even after controlling previous levels, but not vice versa. Furthermore, this influence was similar across different stages of adolescent development. According to the group socialization theory (Harris, 1995) and the stage-environment fit theory (Eccles et al., 1993) peers play a role in socializing an individual. However, this may only happen in the presence of peers (within time), not when explaining future individual risk behavior. The finding that relationship quality decreased over time supported the stage-environment fit theory (Eccles et al., 1993), in which individuals sought more autonomy and independence. Changes in the relationship, however, did not result in changes in individual risk behavior.

Given the model used in the current study, the findings suggest that risk behaviors exhibited by individuals are the most important influence on subsequent individual risk behavior and peer risk behavior. Three potential explanations for this finding are that individuals who have increases in risky behavior may subsequently select riskier peers; individuals may drive increases in subsequent peer risk behavior; or individuals may do both. The first explanation suggests that individuals may self-select into groups for which they identify with or share similar risk propensities (Turner, Hogg, Oakes, Reicher, & Wetherell, 1987). If this is the case, individuals who have increases in risk behavior then seek out peers who demonstrate riskier behaviors. The second explanation suggests individuals may drive increases in peer risk behavior by influencing group norms and behavior. If this is the case, individuals who demonstrate increases in risk behavior may

then influence the behavior of their peers, such that their peers may demonstrate more risk behaviors later on. For example, the individual's behaviors may influence the norms and attitudes of the peer group. The second potential explanation has been found in deviancy training, whereby individuals within a group express acceptability about risk behavior, therefore increasing risk behavior (Dishion, McCord, & Poulin, 1999). However, the current study did not find that increases in peer risk behavior led to subsequent increases in individual risk behavior. Third, it may be a combination of both, in which individuals who have increases in risk behavior then seek out peers who demonstrate riskier behaviors while the individual's behaviors also influence the behavior of their peers via the norms and attitudes of the peer group.

Interventions focusing on the individual is particularly important considering that the current study found effects that were associated with more than half a standard deviation increase in subsequent peer risk behavior for every standard deviation increase in individual risk behavior. Overall, such interventions may decrease the likelihood of adolescents facing consequences that result from engaging in risk behavior or associating themselves with peers who are risky, as being around such peers may lead to legal consequences (e.g., arrest) even though that doesn't cause an individual to have more risk behavior.

The findings from the current study indicate that the individual should be the primary focus of intervention. Based on findings from the current study, individual risk behavior remained fairly stable over time (β = .66 to .79), indicating that the rank ordering of adolescents based on risk behaviors was also fairly stable (i.e., those who demonstrate the most risk behavior at young ages were also the ones most likely to

demonstrate the most risk behavior at older ages). Therefore, intervention should target those individuals who are demonstrating the most risk behavior at early ages. These young individuals may be targeted by replacing opportunity to engage in risk behavior with more positive activities (Reyna & Farley, 2006). Research has suggested altering the context in which risk behavior occurs to provide opportunities to express such behavior while still providing opportunities for increasing self-regulatory capacities (Steinberg, 2008). For example, rather than attempting to suppress risk behavior in adolescence it may be more beneficial to direct these sensation-seeking tendencies towards activities (e.g., school competition, sports, community project) that would allow risk behavior to be expressed in a structured and supervised setting.

In the current study, within-time correlations (non-directional relationships) between were found, even after controlling for previous levels of each construct. There were positive relations between peer and individual risk behavior, and negative relations between peer or individual risk and child-parent relationship quality. These within-time relations may suggest that these influences are important when considering the specific context and present time (Harris, 1995). That is, peers and parents may influence individual risk, and vice versa, when only one time point is considered.

Limitations of the Current Study

As with any study, particularly a developmental study involving risk research, there were several limitations in which the findings must be tempered. First, it should be noted that the conceptualization of risk varies across research studies (Boyer, 2006; Gullone et al., 2000). This study used a conceptualization of risk in which any risky behavior is considered to be negative and potentially lead to undesirable outcomes.

However, some risky behavior is likely normative and therefore difficult to altogether suppress (Steinberg, 2008). It is possible that risk should be considered in terms of the cumulative negative effects associated with engaging in it repeatedly and for a long duration such that it may lead to an undesirable social outcome (e.g., prison, death, teen pregnancy).

Second, although a large longitudinal sample was used to study risk behavior, the sample was predominantly a low risk sample. The low risk profile of the sample may reduce reliable common variance and make finding real and important effects impossible to find.

A third limitation was the use of parcels as indicators of the respective constructs in the study. Parcels were used to provide a more continuous indicator and because the items had a substantial degree of non-normality. Despite the use of parcels, the parceled indicators still exhibited a large degree of non-normality. Furthermore, undimensionality was not fully supported for all facet-representative parcels.

A fourth limitation of the study was the lack of multiple raters of each construct. Adolescent self-report data may impact validity of behavioral responses (Furlong, Sharkey, Bates, & Smith, 2004; Rosenbaum, 2009). Furthermore, adolescents reported on their peers' risky behavior, therefore it is possible there is a rating bias (i.e., individuals rate peers similar to how they view themselves).

Fifth, only the parents' perception (primarily the mothers') was used to gauge the child-parent relationship quality. It is possible that adolescent reports of their relationship with their parent may be more important when considering this relational variable in the context of individual risk behavior. Furthermore, this rating may be measure of mothers'

adjustment to the child during adolescence, rather than a measure of typical relationship quality. Additionally, other research (e.g., Van Ryzin et al., 2012) has included a parental monitoring variable (in addition to child-parent relationship quality) and found important effects, which may have not been found in the current study because the variable used in the current study may not have captured the child-parent dynamic important for explaining changes in future behavior.

Sixth, the inclusion of all behaviors was not possible in this study (e.g., risky sexual behavior), which may reduce the breadth of the risk construct. Last, though this was a developmental study, it did not include the late stage of adolescent development, which made the interpretation of findings limited to a subsample of development within adolescence.

Conclusions and Future Directions

The results of this study offer important findings and a road for future research. The main finding of the study was that individual risk behavior explained individual differences in subsequent peer risk behavior even when previous levels of peer risk behavior were controlled, but not vice versa. This influence was consistent across different stages of adolescent development. Relational variables such as peer risk behavior and child-parent relationship quality did not have an influence on subsequent individual risk behavior once previous levels were taken into account. Individual risk behavior did not explain changes in child-parent relationship quality.

Future research in this area is warranted. First, these inter-variable relations should be examined with the use of multiple raters to indicate each construct. Different raters may have different perceptions and therefore may influence the findings. Second, a

different longitudinal sample with more of a high-risk behavior sample should be used. It is possible that certain relationships are activated in the face of higher levels of risk behavior. Third, other relational variables important in these developmental stages (e.g., school context, community context) should be included in future analysis to determine the relative influence of these different social strata on individual risk behavior. Last, future investigation of these variables should use samples with age ranges extended into early childhood through early adulthood to capture developmental changes throughout critical transition periods. Future risk research should also investigate the stage-environment fit and group socialization theories with measures of parents' social skills, individual risk behavior, and individual prosocial skills. It is possible that variability in social skills explains individual differences in risk behavior beyond previous levels of individual risk behavior.

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Table 1

Prevalence Rates of Youth that Engage in Risk Behaviors

	Rates of Risk Behavior in Middle and High School Grades							Trends	
Risk Behavior	6th	7th	8th	9th	10th	11th	12th	6th–8th	9th–12th
Seatbelts[a]	10.6	10.1	11.4	8.5	7.1	8.0	6.7	Increase	Decrease
Drinking driver[b]*	26.8	31.6	40.0	19.4	21.8	22.6	24.2	Increase	Increase
Carried weapon[c]*	33.2	36.8	42.6	17.5	17.8	17.9	18.3	Increase	Increase
Fighting[d]*	56.5	57.2	60.7	28.3	26.4	24.0	18.8	Increase	Decrease
Suicide attempt[e]	6.3	8.9	9.6	9.3	8.6	7.5	6.2	Increase	Decrease
Cigarette use[f]	19.9	27.2	37.3	31.7	39.0	47.0	48.1	Increase	Increase
Smokeless tobacco[g]	4.2	4.0	6.5	7.3	8.1	10.5	9.4	Increase	Increase
Alcohol use[h]	26.2	37.2	48.7	55.6	64.0	71.2	75.6	Increase	Increase
Marijuana use[i]	5.4	9.7	17.3	30.1	39.1	46.4	48.6	Increase	Increase
Cocaine use[j]	3.1	4.6	4.6	4.4	4.0	6.8	7.1	Increase	Increase
Inhalant use[k]	12.7	14.2	14.4	10.1	7.9	9.9	7.6	Increase	Decrease
Sexual intercourse[l]	11.2	14.7	18.1	30.0	41.4	54.1	64.1	Increase	Increase
Condom use[m]	–	30.0	26.7	37.3	38.3	37.7	47.0	–	Increase

Note. * indicates the item was asked differently in middle school versus high school. The data are from Centers for Disease Control and Prevention Middle School and National Youth Risk Behavior Surveys (2014; 2007). Prevalence rates for each risk behavior across each grade represent the median. Sixth through eighth grade represent medians across states; ninth through twelfth grades represent medians at the national level.

[a] Rarely or never wore seatbelts while riding in a car.

[b] Rode in a car with a driver who has been drinking alcohol; rode with a driver who had been drinking alcohol one or more times during the 30 days before the survey

[c] Ever carried a weapon; carried a weapon on at least 1 day during the 30 days before the survey

[d] Were ever in a physical fight; in a physical fight one or more times during the 12 months before the survey

[e] Attempted suicide

[f] Ever smoked cigarettes

[g] Used smokeless tobacco (e.g., chewing tobacco, snuff, or dip) on 1 or more of the 30 days preceding the survey

[h] Ever drank alcohol

[i] Ever used marijuana

[j] Those who had ever used any form of cocaine (i.e., lifetime cocaine use)

[k] Those who had ever sniffed glue, breathed the contents of spray cans, or inhaled any paints or sprays to get high (i.e., lifetime inhalant use)

[l] Ever had sexual intercourse

[m] Did not use a condom during last sexual intercourse

Table 2

Item and Parcel Descriptives for Individual Risk Behavior

	Fifth Grade				Sixth Grade				Ninth Grade			
Items	Mean	*SD*	Skewness	Kurtosis	Mean	*SD*	Skewness	Kurtosis	Mean	*SD*	Skewness	Kurtosis
Reckless												
Seat	0.93	0.75	0.11	-1.24	1.00	0.78	0.00	-1.35	1.28	0.76	-0.52	-1.08
Bike	1.05	0.81	-0.10	-1.47	1.11	0.85	-0.21	-1.58	1.27	0.86	-0.56	-1.42
Dare	0.22	0.51	2.36	4.61	0.25	0.55	2.13	3.46	0.51	0.72	1.06	-0.29
Rebellious												
Skip	0.01	0.12	10.71	127.71	0.02	0.15	8.49	80.01	0.17	0.46	2.76	6.97
Tobacco	0.01	0.10	9.83	94.79	0.01	0.13	9.80	106.43	0.17	0.49	2.91	7.37
Alcohol	0.04	0.21	5.61	34.01	0.03	0.18	6.09	38.87	0.34	0.64	1.70	1.52
Marijuana	<.01	0.03	31.50	992.00	<.01	0.05	18.30	333.66	0.14	0.45	3.26	9.69
Run away	0.05	0.24	5.09	27.83	0.05	0.22	4.86	24.57	0.05	0.26	5.22	29.23
A lot	0.02	0.13	9.30	95.44	0.01	0.10	12.98	188.46	0.04	0.24	6.47	44.01
A little	0.25	0.49	1.75	2.21	0.21	0.46	2.14	3.90	0.26	0.53	1.94	2.86
W/o Pay	0.05	0.24	5.69	34.99	0.07	0.28	4.53	21.79	0.31	0.56	1.62	1.65
Antisocial												
Carry	0.06	0.28	5.32	29.53	0.07	0.32	4.86	23.92	0.02	0.18	8.72	81.50
Threat	0.05	0.25	4.89	25.59	0.05	0.23	5.05	27.37	0.15	0.44	2.95	8.12
Gang	0.02	0.15	8.42	78.51	0.02	0.15	7.84	66.64	0.05	0.27	5.88	35.54
Fist	0.22	0.49	2.24	4.23	0.19	0.48	2.59	5.91	0.10	0.35	3.79	14.62
Fire	0.01	0.08	18.67	382.25	0.01	0.11	14.16	217.69	0.03	0.19	7.84	66.41
Animal	0.04	0.21	5.18	28.23	0.04	0.20	5.50	32.10	0.04	0.24	6.16	40.47
Broke	<.01	0.00	–	–	<.01	0.03	31.80	1011.00	0.01	0.13	12.69	171.24

Damage	0.03	0.18	5.91	36.37	0.05	0.22	4.93	25.35	0.06	0.27	4.71	23.67
<u>Parcels</u>												
Reckless	0.73	0.54	0.37	-0.74	0.79	0.58	0.32	-0.86	1.02	0.60	-0.05	-0.99
Rebellious	0.05	0.10	2.50	8.64	0.05	0.11	3.68	20.74	0.19	0.29	2.37	6.74
Antisocial	0.06	0.13	2.83	9.75	0.06	0.15	3.77	19.97	0.07	0.17	4.53	30.24

Note. Item responses in 5th grade queried as, "How many times did you ever…", and in 6th and 9th grade as, "How many times in the past year have you…". A (*) denotes slightly different wording at 9th grade. All items had < 1% missing data. Parcels at 5th grade had n = 993–994; at 6th grade n = 1011; at 9th grade n = 955–957.
Seat = Ridden in a car without a seatbelt.
Bike = Ride on a bike without a helmet.
Dare = Do something dangerous on a dare.
Skip = Skipped school without permission.
Tobacco = Smoked cigarettes or used tobacco.
Alcohol = Drunk a bottle or glass of beer or other alcohol.
Marijuana = Used or smoked marijuana (pot, grass, weed).
Run away = Run away from home.
A lot = Taken or stolen something not theirs worth a lot, like a video game.
A little = Taken or stolen something not theirs worth a little, like candy.
W/o pay = Gotten in someplace like a movie or game without paying.
Carry = Carried a weapon (gun or knife) somewhere. *Carried a hidden weapon other than a plain pocket knife.
Threat = Threatened to beat up someone to make them do something.
Gang = Taken part in a gang fight.
Fist = Had a fist fight with another person. *Beat up someone without using a weapon.
Fire = Purposely set fire in a building or in any other place.
Animal = Hurt an animal on purpose.
Broke = Broken into building to take or steal something.
Damage = Purposely damaged or destroyed property that is not theirs.

Table 3

Item and Parcel Descriptives for Peer Risk Behavior

	Fifth Grade				Sixth Grade				Ninth Grade			
Items	Mean	*SD*	Skewness	Kurtosis	Mean	*SD*	Skewness	Kurtosis	Mean	*SD*	Skewness	Kurtosis
Reckless												
Seat	0.85	0.70	0.23	-0.98	1.07	0.70	-0.10	-0.94	1.41	0.62	-0.57	-0.61
Bike	1.09	0.69	-0.12	-0.91	1.26	0.69	-0.38	-0.86	1.55	0.61	-1.01	-0.01
Dare	0.36	0.58	1.39	0.91	0.55	0.68	0.84	-0.46	0.99	0.72	0.02	-1.05
Rebellious												
Skip	0.07	0.28	4.29	19.44	0.09	0.31	3.41	11.65	0.57	0.62	0.63	-0.55
Tobacco	0.03	0.18	6.75	49.79	0.06	0.26	4.35	19.77	0.54	0.62	0.71	-0.47
Alcohol	0.05	0.22	5.17	28.58	0.06	0.26	4.59	22.39	0.74	0.69	0.40	-0.87
Marijuana	0.01	0.09	11.01	119.49	0.03	0.18	7.35	59.60	0.49	0.63	0.91	-0.22
Run away	0.07	0.25	3.69	12.59	0.10	0.32	3.37	11.41	0.22	0.43	1.50	0.74
A lot	0.09	0.31	3.62	13.38	0.10	0.32	3.44	11.98	0.23	0.47	1.87	2.69
A little	0.37	0.54	1.03	-0.01	0.40	0.57	1.08	0.18	0.60	0.67	0.68	-0.63
W/o Pay	0.09	0.31	3.62	13.41	0.15	0.39	2.58	6.19	0.62	0.66	0.61	-0.67
Antisocial												
Carry	0.06	0.26	4.29	19.26	0.09	0.35	3.99	16.14	0.34	0.58	1.47	1.15
Threat	0.13	0.37	2.97	8.62	0.13	0.38	2.92	8.34	0.34	0.55	1.32	0.77
Gang	0.06	0.26	4.76	24.22	0.07	0.29	4.33	19.77	0.19	0.45	2.39	5.10
Fist	0.30	0.52	1.53	1.41	0.35	0.56	1.37	0.91	0.64	0.67	0.58	-0.71
Fire	0.02	0.14	10.13	113.97	0.02	0.14	8.67	82.36	0.06	0.27	4.82	24.81
Animal	0.10	0.32	3.36	11.36	0.08	0.29	3.72	14.13	0.12	0.35	2.99	8.73
Broke	0.01	0.09	16.63	306.56	0.01	0.11	8.65	73.00	0.06	0.25	4.03	16.15

Damage	0.09	0.30	3.26	10.24	0.12	0.33	2.72	6.55	0.24	0.46	1.70	1.92
<u>Parcels</u>												
Reckless	0.76	0.52	0.45	-0.49	0.95	0.56	0.18	-0.78	1.32	0.54	-0.48	-0.53
Rebellious	0.10	0.16	3.42	18.59	0.12	0.21	3.14	14.85	0.50	0.44	0.83	0.13
Antisocial	0.09	0.17	3.45	21.05	0.11	0.19	2.59	8.46	0.25	0.30	1.55	2.54

Note. Item responses across all grades queried as, "How many of the kids you play or hang out with have ever…". All items had < 2% missing data except Seat item at 5th grade (4%) and 6th grade (2.2%). Parcels at 5th grade had n = 988–992; at 6th grade n = 1009–1010; at 9th grade n = 948–953.
Seat = Ridden in a car without a seatbelt.
Bike = Ride on a bike without a helmet.
Dare = Do something dangerous on a dare.
Skip = Skipped school without permission.
Tobacco = Smoked cigarettes or used tobacco.
Alcohol = Drunk a bottle or glass of beer or other alcohol.
Marijuana = Used or smoked marijuana (pot, grass, weed).
Run away = Run away from home.
A lot = Taken or stolen something not theirs worth a lot, like a video game.
A little = Taken or stolen something not theirs worth a little, like candy.
W/o pay = Gotten in someplace like a movie or game without paying.
Carry = Carried a weapon (gun or knife) somewhere.
Threat = Threatened to beat up someone to make them do something.
Gang = Taken part in a gang fight.
Fist = Had a fist fight with another person.
Fire = Purposely set fire in a building or in any other place.
Animal = Hurt an animal on purpose.
Broke = Broken into building to take or steal something.
Damage = Purposely damaged or destroyed property that is not theirs.

Table 4

Item and Parcel Descriptives for Child-Parent Relationship Quality

	Fifth Grade				Sixth Grade				Ninth Grade			
Items	Mean	*SD*	Skewness	Kurtosis	Mean	*SD*	Skewness	Kurtosis	Mean	*SD*	Skewness	Kurtosis
Conflict												
Struggle	3.50	1.28	-0.43	-1.19	3.53	1.27	-0.32	-1.41	4.67	0.59	-2.07	5.20
Angry	3.36	1.24	-0.26	-1.25	3.28	1.26	-0.18	-1.34	3.19	1.26	-0.14	.1.34
Resistant	3.12	1.27	-0.03	.1.38	3.12	1.25	0.03	-1.45	3.07	1.24	0.01	-1.38
Drains	3.55	1.28	-0.37	-1.31	3.48	1.29	-0.26	-1.44	3.45	1.29	-0.28	-1.38
Bad Mood	3.86	1.12	-0.97	-0.02	3.83	1.12	-0.89	-0.22	3.74	1.13	-0.80	-0.39
Unpredict	4.02	1.14	-1.01	.-15	3.91	1.18	-0.89	-0.43	3.64	1.30	-0.57	-1.06
Sneaky	4.21	1.08	-1.31	0.58	4.08	1.11	-1.01	-0.28	3.99	1.15	-0.93	-0.38
Closeness												
Warm	4.86	0.36	-2.79	9.52	4.83	0.44	-3.22	13.82	4.67	0.59	-2.07	5.20
Affection	4.49	1.01	-2.08	3.28	4.34	1.15	-1.62	1.25	3.89	1.30	-0.78	-0.90
Comfort	4.62	0.58	-1.52	2.65	4.52	0.69	-1.90	5.36	4.16	0.84	-1.21	1.49
Value	4.80	0.52	-3.17	12.67	4.81	0.52	-3.45	15.22	4.66	0.61	-1.85	3.37
Praise	4.75	0.52	-2.44	7.99	4.74	0.53	-2.51	8.42	4.45	0.74	-1.52	2.61
Shares	4.34	0.77	-1.48	3.02	4.29	0.79	-1.53	3.27	3.94	0.97	-1.11	0.79
Tune	4.31	0.80	-1.42	2.67	4.29	0.75	-1.24	2.20	4.01	0.91	-1.10	1.15
Open	4.42	0.75	-1.71	4.34	4.36	0.73	-1.42	2.88	4.07	0.89	-1.25	1.61
Parcels												
Conflict	3.66	0.85	-0.4	-0.57	3.60	0.89	-0.33	0.76	3.50	0.93	-0.38	-0.67
Closeness	4.57	0.41	-1.39	2.57	4.52	0.45	-1.53	3.73	4.23	0.56	-1.09	1.42

Note. Item responses across all grades primarily reported by mother. Conflict items

reverse coded, higher ratings indicate lower conflict. All items had < 2% missing data. Parcels at 5th grade had *n* = 1012; at 6th grade *n* = 1019; at 9th grade *n* = 969.
Struggle = My child and I always struggling with each other.
Angry = My child easily becomes angry at me.
Resistant = Child is angry/resistant after being disciplined.
Drains = Dealing with my child drains my energy.
Bad Mood = Child wakes up in bad mood, difficult day.
Unpredict = Child's feelings to me can be unpredictable.
Sneaky = My child is sneaky/manipulative with me.
Warm = I share affectionate/warm relationship with my child.
Affection = Child is uncomfortable with physical affection (reflected).
Comfort = If upset, my child seeks comfort from me.
Value = My child values his/her relationship with me.
Praise = I praise child, he/she beams with pride.
Shares = Child spontaneously shares personal information.
Tune = Easy in tune with what my child is feeling.
Open = Child openly shares feelings/experience with me.

Table 5

Standardized Factor Loadings from Unidimensionality Tests of Reckless, Rebellious, and Antisocial Behavior in Individual Risk Behavior

Items	Fifth Grade	Sixth Grade	Ninth Grade
Reckless			
Seat	.871	.786	.774
Bike	.761	.851	.749
Dare	.564	.734	.679
Rebellious			
Skip	.733	.694	.733
Tobacco	.648	.983	.894
Alcohol	.633	.855	.861
Marijuana	–	–	.890
Run away	.389	.517	.547
A lot	–	.817	.806
A little	.475	.637	.622
W/o Pay	.647	.606	.496
Antisocial			
Carry	.575	.626	.813
Threat	.814	.826	.753
Gang	.723	.816	.846
Fist	.733	.806	.757
Fire	–	.812	.741
Animal	.435	.597	.486
Broke	–	–	–
Damage	.603	.765	.821

Note. A – indicates item was removed from unidimensionality testing due to lack of covariance or coverage with other items. All standardized factor loadings statistically significant at $p < .05$.

Table 6

Standardized Factor Loadings from Unidimensionality Tests of Reckless, Rebellious, and Antisocial Behavior in Peer Risk Behavior

Items	Fifth Grade	Sixth Grade	Ninth Grade
Reckless			
Seat	.812	.785	.892
Bike	.750	.854	.905
Dare	.601	.701	.742
Rebellious			
Skip	.727	.777	.865
Tobacco	.894	.914	.781
Alcohol	.675	.859	.729
Marijuana	.966	.966	.793
Run away	.566	.580	.626
A lot	.834	.862	.891
A little	.710	.736	.759
W/o Pay	.751	.729	.723
Antisocial			
Carry	.620	.648	.802
Threat	.804	.851	.812
Gang	.806	.812	.800
Fist	.686	.756	.801
Fire	.750	.564	.789
Animal	.559	.644	.558
Broke	.697	.680	.801
Damage	.767	.722	.763

Note. A – indicates item was removed from unidimensionality testing due to lack of covariance or coverage with other items. All standardized factor loadings statistically significant at $p < .05$.

Table 7

Standardized Factor Loadings from Unidimensionality Tests for Closeness and Conflict in Child-Parent Relationship Quality

Items	Fifth Grade	Sixth Grade	Ninth Grade
Conflict			
Struggle	.657	.772	.817
Angry	.788	.849	.797
Resistant	.701	.716	.700
Drains	.754	.810	.850
Bad Mood	.687	.657	.717
Unpredict	.801	.810	.842
Sneaky	.652	.628	.670
Closeness			
Warm	.831	.769	.786
Affection	.450	.438	.436
Comfort	.771	.749	.787
Value	.754	.841	.788
Praise	.507	.593	.578
Shares	.616	.643	.602
Tune	.656	.700	.704
Open	.680	.765	.731

Note. All standardized factor loadings statistically significant at $p < .05$. Item responses indicated primarily by mother.

Table 8

Coefficient Alphas for Individual Risk Behavior, Peer Risk Behavior, and Child-Parent Relationship Quality Scales and Parcels

Scale/Parcel	Fifth Grade	Sixth Grade	Ninth Grade
Scale			
Individual Risk	.684 (19)	.737 (19)	.815 (19)
Peer Risk	.807 (19)	.845 (19)	.815 (19)
Child-Parent	.821 (15)	.846 (15)	.851 (15)
Parcel			
Individual Reckless	.635 (3)	.686 (3)	.651 (3)
Individual Rebellious	.335 (8)	.531 (8)	.766 (8)
Individual Antisocial	.489 (7)	.617 (7)	.682 (7)
Peer Reckless	.662 (3)	.733 (3)	.784 (3)
Peer Rebellious	.681 (8)	.766 (8)	.872 (8)
Peer Antisocial	.666 (8)	.696 (8)	.793 (8)
Child-Parent Conflict	.835 (7)	.855 (7)	.870 (7)
Child-Parent Closeness	.731 (8)	.759 (8)	.785 (8)

Note. The number in parentheses represents the number of items. The same items were used across grades.

Table 9

Factor Intercorrelations of Peer Risk Behavior, Individual Risk Behavior, and Child-Parent Relationship Quality for Fifth, Sixth, and Ninth Grades

Latent Variable	Peer5	Indiv5	CP5	Peer6	Indiv6	CP6	Peer9	Indiv9	CP9
Peer5	–								
Indiv5	**.83**	–							
CP5	-.10	**-.17**	–						
Peer6	**.68**	**.73**	**-.17**	–					
Indiv6	**.60**	**.76**	**-.19**	**.86**	–				
CP6	**-.17**	**-.21**	**.76**	**-.28**	**-.26**	–			
Peer9	**.40**	**.52**	-.08	**.49**	**.58**	**-.12**	–		
Indiv9	**.34**	**.48**	**-.12**	**.49**	**.57**	**-.15**	**.82**	–	
CP9	-.04	**-.15**	**.54**	**-.15**	**-.20**	**.56**	**-.30**	**-.36**	–

Note. Peer = Peer Risk Behavior; Indiv = Individual Risk Behavior; CP = Child-Parent Relationship Quality. Bolded values are statistically significant at $p < .05$.

Table 10

Standardized Factor Loadings for Peer Risk Behavior, Individual Risk Behavior, and Child-Parent Relationship Quality in Fifth, Sixth, and Ninth Grades

Construct/Indicator	Fifth Grade		Sixth Grade		Ninth Grade	
Peer	Loading	*SE*	Loading	*SE*	Loading	*SE*
Antisocial	.84	.03	.85	.03	.85	.02
Rebellious	.79	.03	.80	.02	.85	.02
Reckless	.56	.05	.58	.04	.61	.03
Individual						
Antisocial	.74	.03	.77	.04	.65	.04
Rebellious	.63	.04	.64	.05	.77	.04
Reckless	.59	.03	.62	.03	.60	.03
Child-Parent						
Closeness	.65	.08	.66	.08	.61	.07
Conflict	.54	.07	.60	.07	.59	.06

Note. Values derived from configural model. All factor loadings are statistically significant at $p < .05$.

Table 11

Longitudinal Invariance of Measurement and Structural Parameters Across Fifth, Sixth, and Ninth Grades

Model tested	χ^2 (*df*)	$\Delta\chi^2$ (Δdf)	*p*	RMSEA Est. [90% CI]	CFI	ΔCFI	TLI	AIC	BIC
Measurement Parameters[1]									
1. Independence (null)	24968.11 (308)	–	–	–	–	–	–	–	–
2. Configural Invariance	1673.75 (192)	–	–	.086 [.083–.090]	.940	–	.892	10798.90	12147.08
2a. Configural Invariance	737.60 (183)	–	–	.054 [.050–.058]	.978	–	.950	9655.23	11058.02
3. Weak Invariance[a]	967.60 (193)	–	–	.062 [.058–.066]	.969	.009	.938	9987.81	11331.03
4. Strong Invariance[b]	1361.30 (203)	–	–	.074 [.070–.077]	.953	.016	.917	10468.90	11762.55
4a. Free Peer Rebellious Intercept at 9th[b]	1299.79 (202)	–	–	.072 [.068–.076]	.955	.013	.921	10389.71	11688.32
4b. Free Peer Reckless Intercept at 5th[b]	1216.28 (201)	–	–	.069 [.066–.073]	.959	.010	.925	10287.08	11590.65
Latent Parameters[2]									
5. Equivalent Factor Variances[c]	1367.19 (207)	93.76 (6)	.001	.073 [.069–.077]	.953	–	.919	10517.07	11790.90
5a. Peer Factor Variance[c]	1370.53 (203)	60.45 (2)	.001	.074 [.070–.078]	.953	–	.917	10510.51	11804.17
5b. Individual Factor Variance[c]	1246.72 (203)	20.58 (2)	.001	.070 [.066–.074]	.958	–	.924	10339.63	11633.28
5c. Quality Factor Variance[c]	1227.96 (203)	11.63 (2)	.003	.069 [.066–.073]	.958	–	.925	10295.10	11589.65
6. Equivalent Latent Means[c]	1534.85 (205)	538.86 (4)	.001	.079 [.075–.082]	.946	–	.908	10662.57	11946.32
6a. Individual Latent Mean[c]	1333.78 (203)	204.24 (2)	.001	.073 [.069–.077]	.954	–	.919	10406.18	11699.84
6b. Quality Latent Mean[c]	1471.38 (203)	273.98 (2)	.001	.077 [.073–.081]	.949	–	.911	10601.98	11895.64

Note. Peer = Peer Risk Behavior. Individual = Individual Risk Behavior. Quality = Child-Parent Relationship Quality. 1 = Evaluated using ΔCFI test. 2 = Evaluated using χ^2 difference test. a = Compare to configural invariance model. b = Compare to weak invariance model. c = Compare to final measurement invariance model. The $\Delta\chi^2$ values were calculated using a scaling correction factor (Satorra-Bentler). Nested χ^2 difference tests statistically significant at $p < .05$.

Table 12

Latent Means and Standardized Effect Sizes for the Latent Mean Differences for Individual Risk Behavior and Child-Parent Relationship Quality in Fifth, Sixth, and Ninth Grades

Construct	5th Grade Mean	6th Grade Mean	9th Grade Mean	5th–6th ES	Cohen's *d*	6th–9th ES	Cohen's *d*
Individual Risk	0.050	0.053	0.102	–	–	0.48	Medium
Child-Parent	4.575	4.524	4.237	-0.11	Small	-0.55	Medium

Note. Cohen's *d* effect size values used: small = 0.20, medium = 0.50, and large = 0.80. Individual Risk latent means were equivalent for 5th and 6th grade, therefore no effect size was calculated for that period.

Table 13

Fit Statistics for Structural Model Evaluation of the Unconditional and Conditional Longitudinal Cross-Lagged Panel Models

Model tested	χ^2 (*df*)	$\Delta\chi^2$ (Δdf)	*p*	RMSEA Est. [90% CI]	CFI	TLI	AIC	BIC	Retain?
Unconditional									
1. Autoregressive (Equivalent)	1346.20 (226)	–	–	.069 [.065–.072]	.955	.927	10415.73	11595.38	Yes
2. Autoregressive (Free 8th to 9th)[a]	1362.45 (223)	1.71 (3)	.640	.070 [.066–.073]	.954	.925	10417.30	11611.83	No
3. Cross-Lagged (Equivalent)[a]	1255.21 (220)	95.81 (6)	.001	.067 [.063–.071]	.958	.930	10315.87	11525.27	Yes
4. Cross-Lagged (Equivalent; pruned)[b]	1257.88 (225)	2.35 (5)	.805	.066 [.063–.070]	.958	.931	10308.80	11493.41	Yes
5. Cross-Lagged (Free 8th to 9th; pruned)[c]	1255.51 (224)	3.44 (1)	.064	.066 [.063–.070]	.958	.931	10304.30	11493.87	No
Conditional									
6. Autoregressive (Equivalent)	1739.93 (331)	–	–	.064 [.061–.067]	.943	.935	10601.39	11260.61	Yes
7. Autoregressive (Free 8th to 9th)[d]	1756.68 (328)	0.99 (3)	.803	.064 [.061–.067]	.942	.934	10604.83	11278.92	No
8. Cross-Lagged (Equivalent)[d]	1642.16 (325)	96.57 (6)	.001	.062 [.059–.065]	.947	.938	10494.84	11183.80	Yes
9. Cross-Lagged (Equivalent; pruned)[e]	1643.93 (330)	3.84 (5)	.573	.062 [.059–.065]	.947	.939	10489.83	11154.01	Yes
10. Cross-Lagged (Free 8th to 9th; pruned)[f]	1641.68 (329)	3.25 (1)	.072	.062 [.059–.065]	.947	.938	10485.74	11154.87	No

Note. Evaluated using χ^2 difference test. The $\Delta\chi^2$ values were calculated using a scaling correction factor (Satorra-Bentler). Nested χ^2 difference tests statistically significant at $p < .05$. a = Compare to unconditional autoregressive (equivalent) model. b = Compare to unconditional cross-lagged (equivalent) model. c = Compare to unconditional cross-lagged (equivalent; pruned) model. d = Compare to conditional autoregressive (equivalent) model. e = Compare to conditional cross-lagged (equivalent) model. f = Compare to cross-lagged (equivalent; pruned) model.

Table 14

Unstandardized and Standardized Regression Coefficients and Proportion of Variance Explained for the Final Conditional Cross-Lagged Panel Model

Regression Path	Unstandardized Parameter Estimates (SE)			
Autoregressive	5th to 6th	6th to 7th	7th to 8th	8th to 9th
Peer	.41 (.10)	.41 (.10)	.41 (.10)	.41 (.10)
Individual	.94 (.02)	.94 (.02)	.94 (.02)	.94 (.02)
Child-Parent	.86 (.03)	.86 (.03)	.86 (.03)	.86 (.03)
Cross-Lagged				
Individual to Peer	1.01 (.18)	1.01 (.18)	1.01 (.18)	1.01 (.18)
	Standardized Parameter Estimates (SE)			
Autoregressive	5th to 6th	6th to 7th	7th to 8th	8th to 9th
Peer	.33 (.07)	.43 (.10)	.42 (.10)	.25 (.06)
Individual	.79 (.04)	1.00 (.00)	1.00 (.00)	.66 (.05)
Child-Parent	.76 (.04)	1.00 (.00)	1.00 (.00)	.59 (.05)
Cross-Lagged				
Individual to Peer	.48 (.07)	.61 (.10)	.59 (.10)	.33 (.06)

	Proportion of Variance Explained (SE)		
Latent Variable	5th	6th	9th
Peer	.16 (.03)	.59 (.05)	.33 (.04)
Individual	.17 (.03)	.62 (.07)	.44 (.06)
Child-Parent	.02 (.01)	.58 (.06)	.35 (.06)

Note. All regression coefficients statistically significant at $p < .05$. Corresponding unstandardized regression coefficients constrained to be equal since using phantom variables at 7th and 8th grades. The standardized estimates for individual and child-parent from 6th to 8th grade are 1 because 7th and 8th grade have no variance, and have only one predicted pathway (i.e., the autoregressive pathways), whereas peer has two predicted pathways from which to extract variance used to scale the unstandardized pathway into the standardized.

Table 15

Within-Time Correlations/Residual Correlations in the Final Conditional Cross-Lagged Panel Model

Latent Variable	Peer5	Indiv5	Peer6	Indiv6	Peer9	Indiv9
Peer5						
Indiv5	**.77**					
CP5	-.05	**-.11**				
Peer6						
Indiv6			**.65**			
CP6			**-.22**	**-.18**		
Peer9						
Indiv9					**.70**	
CP9					**-.31**	**-.39**

Note. Peer = Peer Risk Behavior; Indiv = Individual Risk Behavior; CP = Child-Parent Relationship Quality. Bolded correlations are statistically significant at $p < .05$.

Table 16

Unstandardized Coefficients for Gender, SES, and Race/Ethnicity Covariates at 5th Grade in the Final Conditional Cross-Lagged Panel Model

Covariate	Peer Risk Behavior		Individual Risk Behavior		Child-Parent Relationship Quality	
Gender	Unstd. (SE)	*p*-value	Unstd. (SE)	*p*-value	Unstd. (SE)	*p*-value
Male	.046 (.009)	.001	.035 (.007)	.001	-.104 (.073)	.155
SES						
Mother's Ed.	-.010 (.002)	.001	-.006 (.001)	.001	.034 (.016)	.033
Race/Ethnicity						
Black	.100 (.020)	.001	.056 (.011)	.001	-.298 (.129)	.021
Hispanic	-.001 (.020)	.949	.014 (.015)	.352	.069 (.143)	.631
Other	.021 (.022)	.353	.014 (.012)	.252	-.141 (.164)	.388

Note. Unstd. = Unstandardized estimate. Males compared to females with higher scores indicating males are higher on that variable. SES variable mean-centered at mother's average level of education (14.4 years). White is reference variable for race/ethnicity dummy variables.

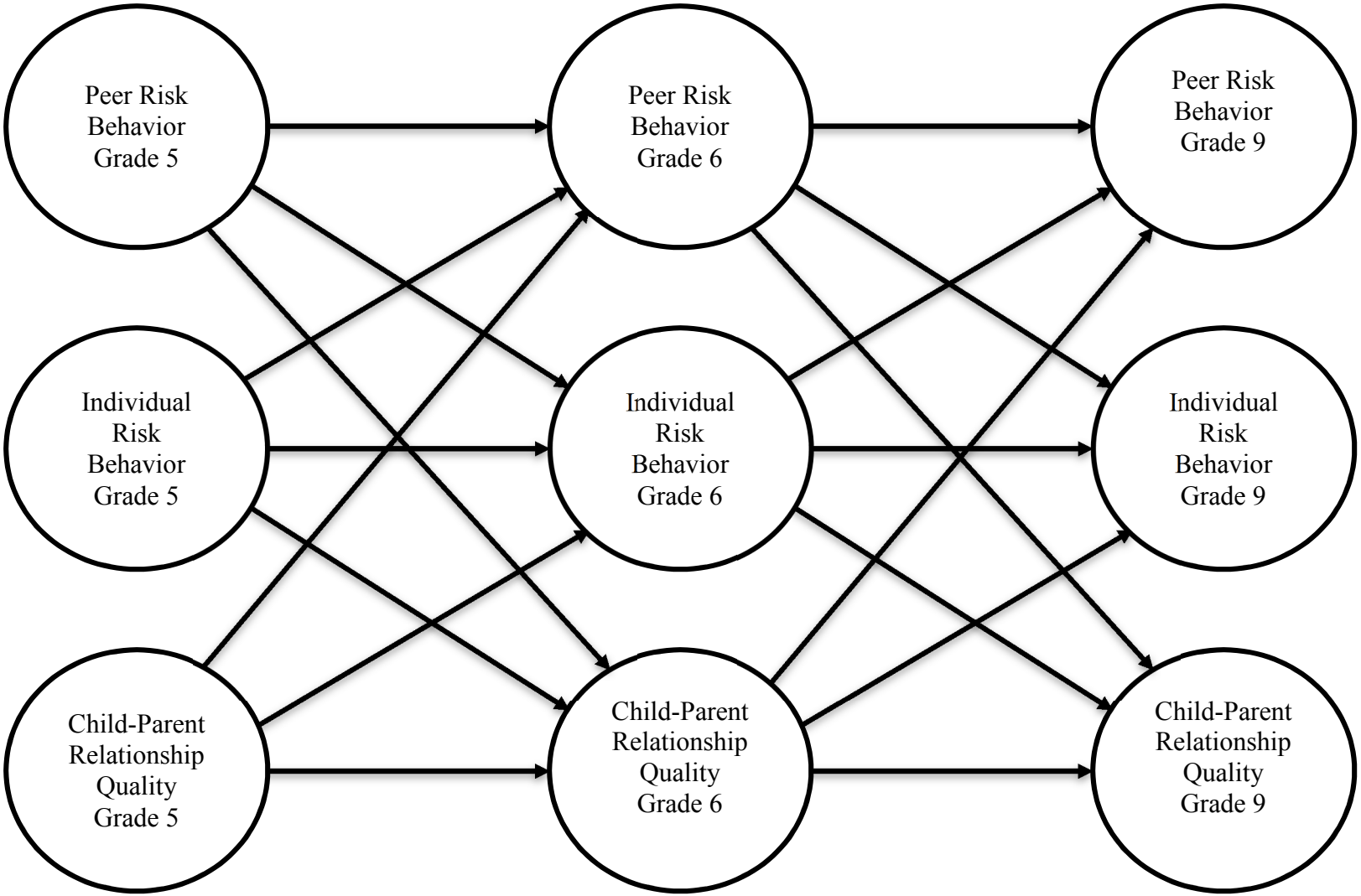
Table 17

Multiple-Group Longitudinal Invariance of Latent Regressions

Multiple-group model tested	χ^2 (*df*)	$\Delta\chi^2$ (Δdf)	*p*	RMSEA Est. [90% CI]	CFI	TLI	AIC	BIC
Unconditional model								
Latent regressions unconstrained across gender	1558.32 (445)	–	–	.069 [.065–.073]	.955	.957	8180.09	10276.71
Latent regressions constrained across gender[a]	1569.39 (454)	14.63 (9)	.102	.068 [.065–.072]	.955	.957	8182.90	10234.91
Conditional model								
Latent regressions unconstrained across gender	1879.50 (613)	–	–	.063 [.060–.066]	.949	.962	8169.31	9433.23
Latent regressions constrained across gender[b]	1890.08 (622)	14.48 (9)	.106	.062 [.059–.066]	.949	.963	8172.81	9392.12

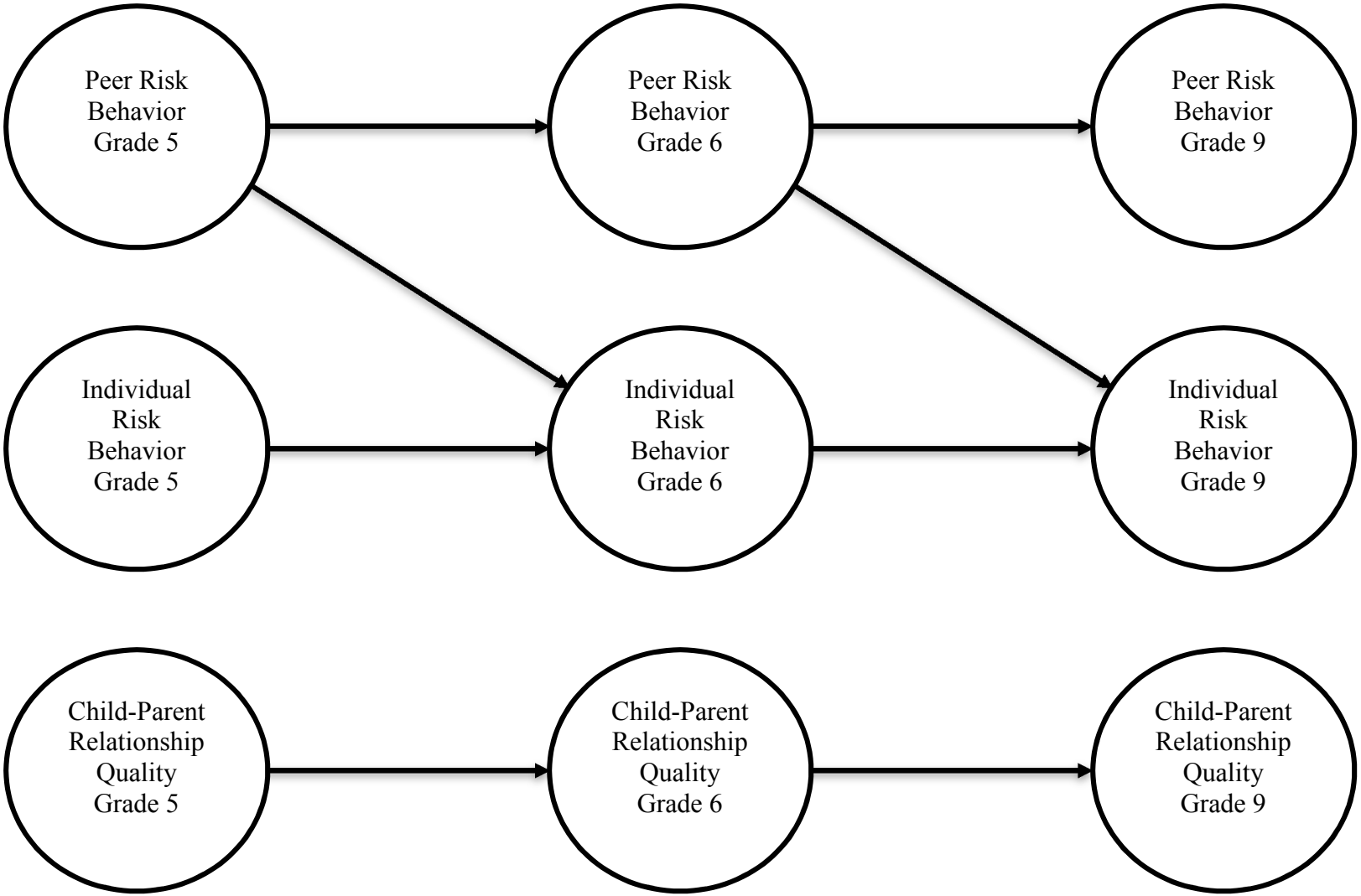
Note. Evaluated using χ^2 difference test. The $\Delta\chi^2$ values were calculated using a scaling correction factor since MLR estimation (maximum likelihood estimation with robust standard errors) was used. Nested χ^2 difference test statistically significant at $p < .05$. a = Compare to unconditonal latent regressions unconstrained across gender model. b = Compare to conditional latent regressions unconstrained across gender model.

Figure 1. Initial model estimated



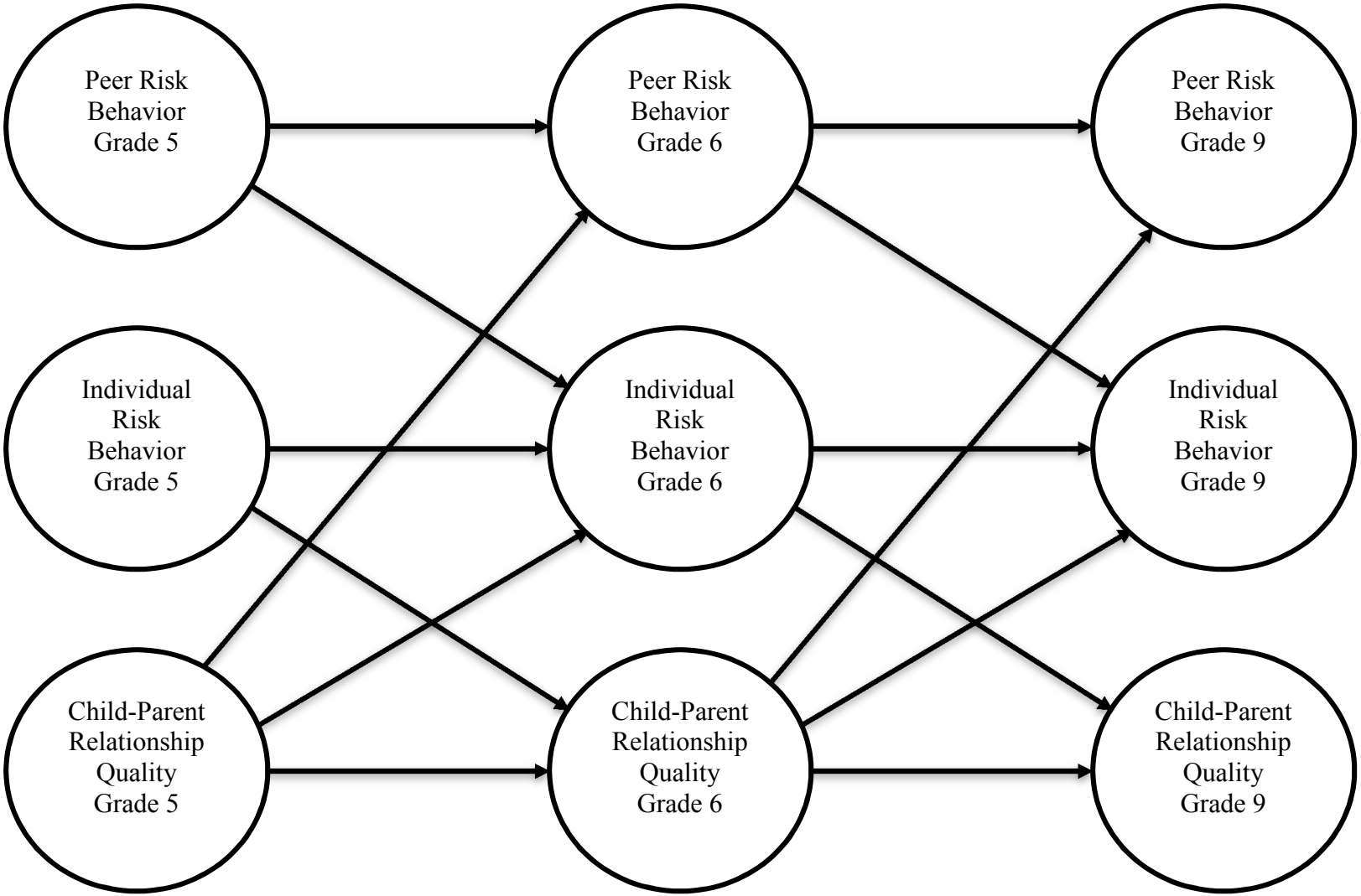
Note. Observed indicators, latent correlations, latent residual correlations, and covariates are not shown. Child-parent relationship quality was indicated primarily by mother.

Figure 2. Hypothesized model for the Group Socialization Theory (Harris, 1995).



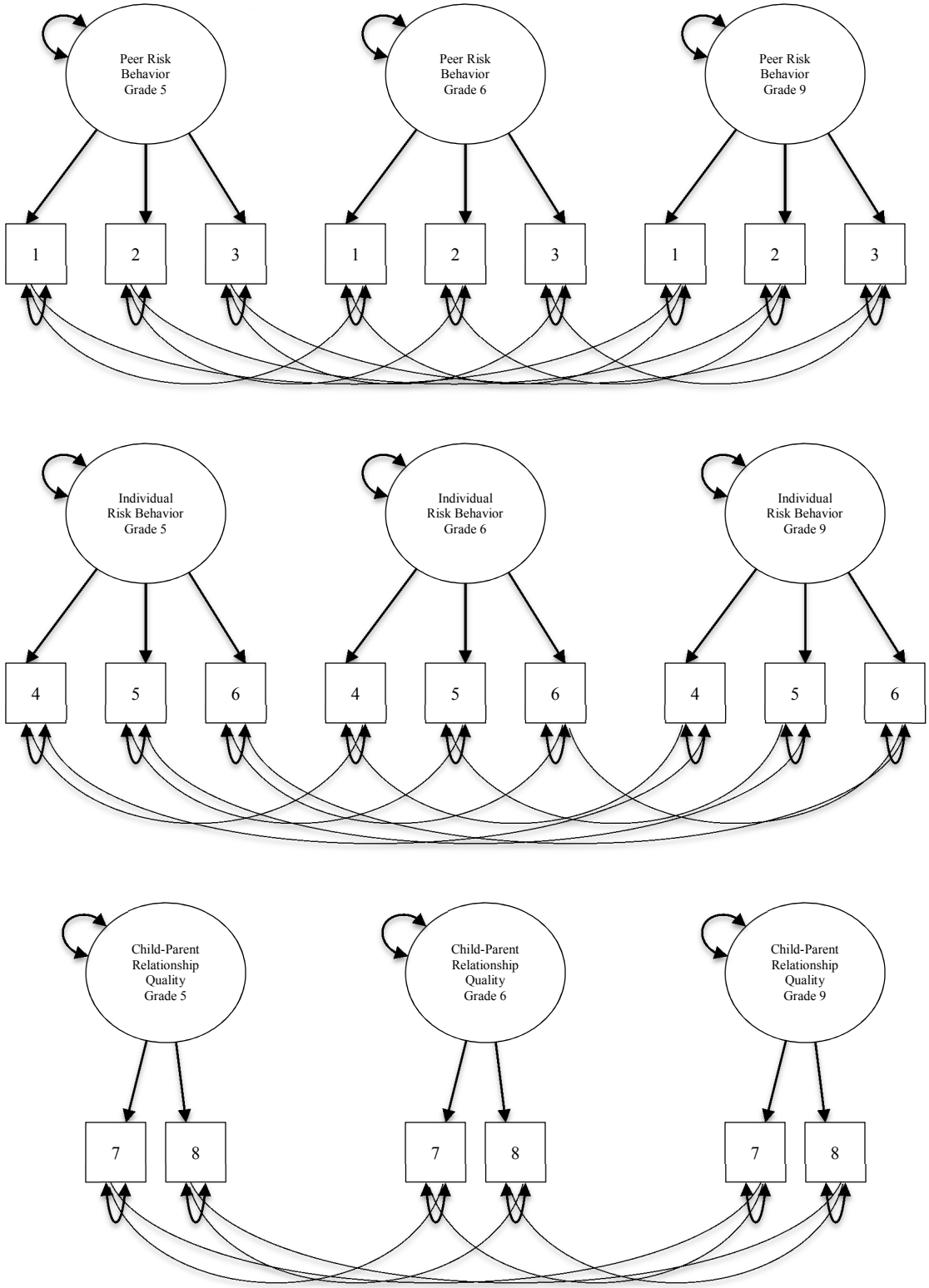
Note. Observed indicators, latent correlations, latent residual correlations, and covariates are not shown. Child-parent relationship quality was indicated primarily by mother.

Figure 3. Hypothesized model for the Stage-Environment Fit Theory (Eccles et al., 1993).



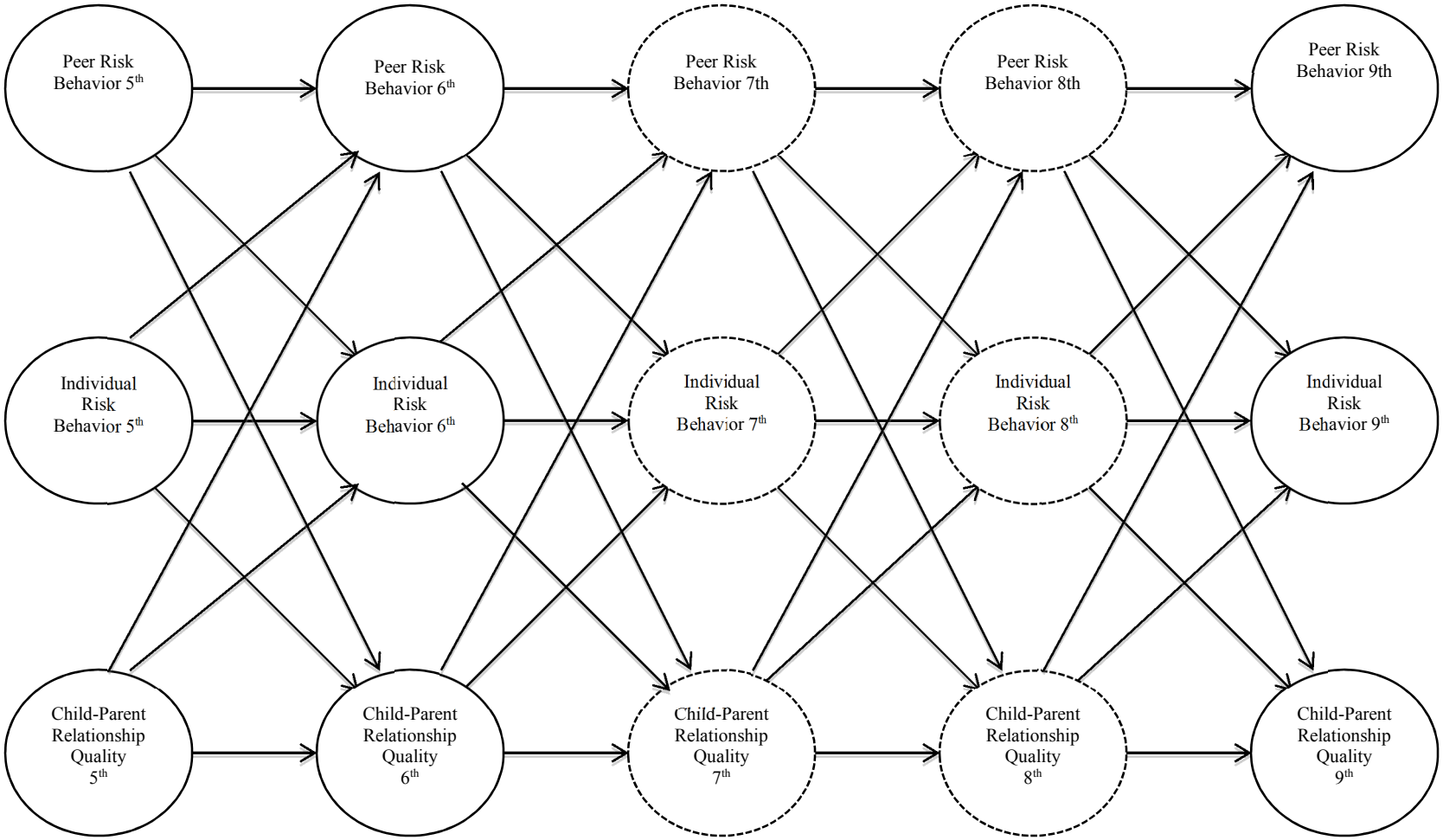
Note. Observed indicators, latent correlations, latent residual correlations, and covariates are not shown. Child-parent relationship quality was indicated primarily by mother.

Figure 4. Configural (unconstrained) longitudinal CFA model for peer risk behavior, individual risk behavior, and child-parent relationship quality across grade 5, grade 6, and grade 9.



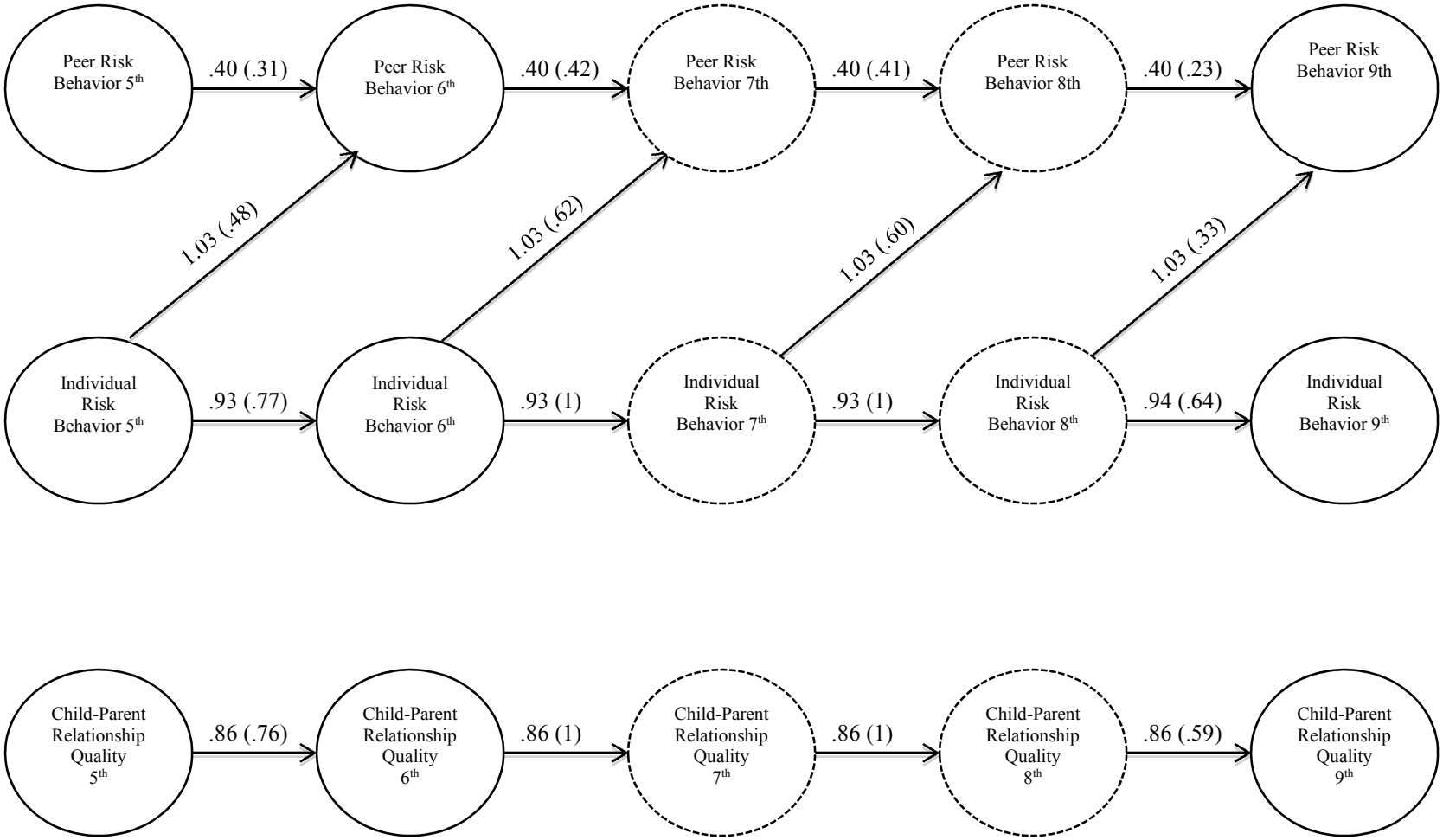
Note. Marker variable method used to identify scale. First factor loading and corresponding indicator mean set to 1 and 0 respectively, for each construct. Factor variances/covariances, factor means, factor loadings, indicators means, and residual variances freely estimated. Latent covariances not shown. Child-parent relationship quality was indicated primarily by mother.

Figure 5. Cross-lagged panel model with phantom variables.



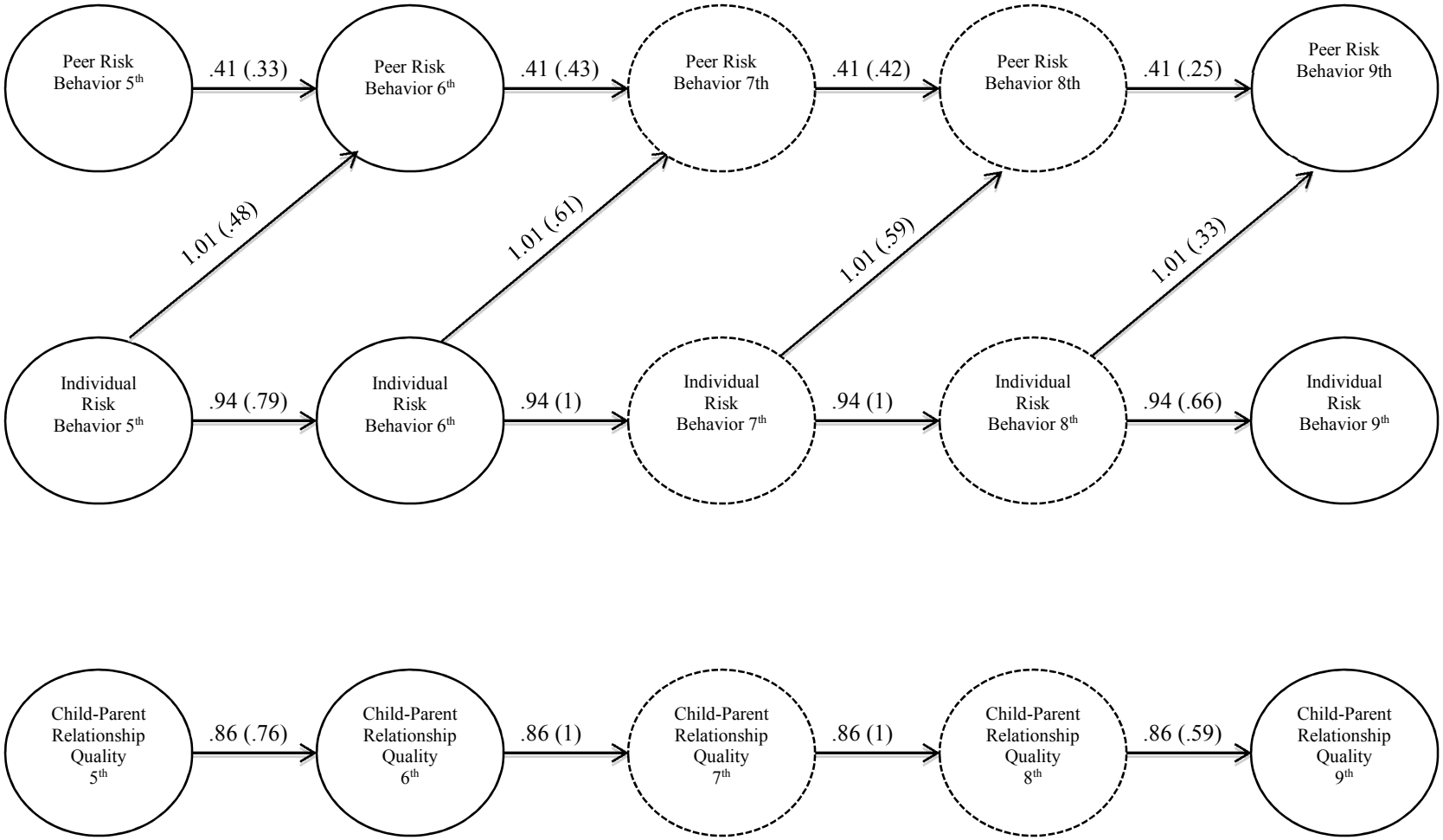
Note. Observed indicators, latent within-time correlations/residual correlations, and covariates are not shown. Dashed lines indicate phantom variables, which are at discrete time points, 7th and 8th grades. Child-parent relationship quality was indicated primarily by mother.

Figure 6. Final unconditional cross-lagged panel model with phantom variables.



Note. Observed indicators and latent within-time correlations/residual correlations are not shown. Dashed lines indicate phantom variables, which are at discrete time points, 7th and 8th grades. All corresponding regression pathways are equivalent. Unstandardized estimates shown with standardized estimates in parentheses. Child-parent relationship quality was indicated primarily by mother.

Figure 7. Final conditional cross-lagged panel model with phantom variables.



Note. Observed indicators, latent within-time correlations/residual correlations, and covariates are not shown. Dashed lines indicate phantom variables, which are at discrete time points, 7th and 8th grades. All corresponding regression pathways are equivalent. Unstandardized estimates shown with standardized estimates in parentheses. Child-parent relationship quality was indicated primarily by mother.

Appendix

The NICHD Study of Early Child Care and Youth Development

Questionnaire 1. *Things I Do/Things My Friends Do*, 5th and 6th grade

1. Ride in a car without a seatbelt
2. Ride on a bike without a helmet
3. Do something dangerous on a dare
4. Carry a weapon somewhere
5. Threaten to beat up someone to make them do something
6. Take part in a gang fight
7. Skip school without permission
8. Have a fist fight with another person
9. Purposely set a fire in a building or in any other place
10. Hurt an animal on purpose
11. Smoke a cigarette or use tobacco
12. Drink a bottle or glass of beer or other alcohol
13. Use or smoke marijuana, grass, pot, weed
14. Take or steal something not yours worth a lot, like a video game
15. Take or steal something not yours worth a little, like candy
16. Get into someplace like a movie or game without paying
17. Run away from home
18. Break into a building to take or steal something
19. Purposely damage or destroy property that wasn't yours

The NICHD Study of Early Child Care and Youth Development

Questionnaire 2. *Things I Do*, 9th Grade

*Denotes item was used

1. Ridden in a car without a seatbelt*
2. Ridden on a bike without a helmet*
3. Driven a car without a seatbelt
4. Ridden on a motorcycle, motor scooter, or off-road/terrain vehicle without a helmet
5. Done something dangerous on a dare*
6. Threatened to beat up someone to make them do something*
7. Taken part in a gang fight*
8. Been a gang member or gang affiliated
9. Sold drugs
10. Been threatened by someone with any kind of weapon, like a gun, knife, or a bat
11. Been beaten up or mugged by someone
12. Been injured by any kind of weapon, like a gun, knife or bat
13. Been shot at
14. Been shouted at, made fun of, or threatened by a person you were dating (going out with)
15. Been physically hurt (such as been slapped, pushed, or punched) on purpose by a person you were dating (going out with)
16. Been forced to have sex that you did not want to have by a person you were dating (going out with)
17. Been harassed because of your race/ethnicity
18. Been harassed because of your sexual orientation
19. Been harassed because of a disability
20. Been harassed because of your gender (being male or female)
21. Had someone steal or deliberately damage your property (such as your car, clothing, or books)
22. Had friends shot at
23. Had relatives shot at
24. Fired a gun
25. Attacked someone with the idea of seriously hurting them
26. Been on probation
27. Been in juvenile detention
28. Been injured from a physical fight
29. Been in a fight between groups of kids
30. Used a weapon (gun, knife, or club) to threaten or bully someone
31. Been suspended or expelled from school
32. Carried a hidden weapon other than a plain pocket knife*
33. Vandalized property/did graffiti
34. Stolen something from someone without using a weapon

35. Stolen something from someone using a weapon
36. Threatened to attack a person using a weapon

The NICHD Study of Early Child Care and Youth Development

Questionnaire 2. *Things I Do*, 9th Grade (cont.)

37. Beat up someone without using a weapon*
38. Beat up someone using a weapon
39. Been arrested
40. Skipped school without permission*
41. Purposely set a fire in a building or in any other place*
42. Hurt an animal on purpose*
43. Smoked cigarettes or used tobacco*
44. Drunk a bottle or a glass of beer or other alcohol*
45. Used or smoked marijuana (pot, grass, weed)*
46. Taken or stolen something worth a lot, like a video game*
47. Taken or stolen something worth a little, like candy*
48. Gotten into a place that charges admission, like a movie or a baseball game, without paying*
49. Run away from home*
50. Broken into a building to take or steal something*
51. Purposely damaged or destroyed property that wasn't yours*
52. Had oral sex
53. Had sexual intercourse (going all the way)
54. Got pregnant or got a girl pregnant
55. Been told by a doctor or nurse that you have a STD (sexually transmitted disease or infection)

How many different partners have you had ORAL SEX with…

56. …in your ENTIRE LIFE
57. …in the last 30 DAYS

How many different partners have you had SEXUAL INTERCOURSE with...

58. …in your ENTIRE LIFE
59. …in the last 30 DAYS

60.a. How many cigarettes have you smoked in your lifetime?

0. None
1. 1 or 2
2. 3–10
3. 11–20
4. More than 20

60.b. If more than 20 cigarettes, how many packs have you smoked in your lifetime?

1. 1 or 2
2. 3–10
3. 11–20
4. More than 20

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Questionnaire 3. *Things My Friends Do*, 9th Grade

*Denotes item was used

1. Ridden in a car without a seatbelt*
2. Ridden on a bike without a helmet*
3. Done something dangerous on a dare*
4. Carried a weapon (gun or knife) somewhere*
5. Threatened to beat up someone to make them do something*
6. Taken part in a gang fight*
7. Skipped school without permission*
8. Had a fist fight with another person*
9. Purposely set a fire in a building or in any other place*
10. Hurt an animal on purpose*
11. Smoked cigarettes or used tobacco*
12. Drunk a bottle or glass of beer or other alcohol*
13. Used or smoked Marijuana (pot, grass, weed)*
14. Taken or stolen something worth a lot, like a video game*
15. Taken or stolen something worth a little, like candy*
16. Gotten in some place that charges admission, like a movie or baseball game, without paying*
17. Run away from home*
18. Broken into a building to take or steal something*
19. Purposely damaged or destroyed property that is not theirs*
20. Been gang members or gang affiliated
21. Sold drugs
22. Been arrested
23. Tried to be someone they're not
24. Had oral sex
25. Had sexual intercourse (going all the way)
26. Became pregnant or got someone pregnant?
27. Been told by a doctor/nurse that they have an STD (sexually transmitted disease or infection)?